THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

EDITORIAL, ADVERTISING AND PUBLISHING OFFICE:
Dorset House, Stamford Street, London, S.E.1
Telegraphic Address: "Ageekay, Sedist, London." Code, A B C.
Telephone No.: Waterloo 3333 (50 lines).
Subscription Rates, Postage free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Index to Advertisers p. xl. Classified Advertisements—Supp. 15.

Vol. CXXIV. No. 3213 JUNE 23, 1939 Price SIXPENCE

Distribution Reorganisation

Comprehensive I.M.E.A. Proposals

IN a letter published in this issue Mr. A. J. C. De Renzi, hon. secretary of the Committee of Smaller Municipal Electricity Supply Undertakings, takes us to task for not giving more space to the proposals for the reorganisation of electricity distribution which were contained in the I.M.E.A.'s annual report.

It was not that we did not appreciate those proposals, however, for we are in agreement with Mr. De Renzi that it is far better for the electricity supply industry to evolve a scheme than to have one forced upon it. We assumed that all interested readers were familiar with the nature of the recommendations, which follow closely, with some amplification, the main lines of the proposals put forward by the Committee of which Mr. De Renzi is secretary as "Basis D" (following on the Bases A, B and C put forward in the "White Paper" which was published by the Ministry of Transport about two years ago).

The proposals were reviewed by us at the time of their introduction (ELECTRICAL REVIEW, July 9th, 1937), but as that was rather a long time ago we may, perhaps, be excused for referring to them again, in the form in which they appeared in the I.M.E.A. annual report.

Public Control

The "vital principles" animating the proposals were said to be: "1. To preserve public control. 2. To retain the identity and preserve the local interest and goodwill of existing efficient undertakings, irrespective of size."

As a first step in this direction the establishment of an "over-riding authority" (not a happy term!) was suggested, and as it was considered undesirable to add to the already adequate number of electrical bodies the Electricity Commission was suggested as the appropriate authority.

The next recommendation was that the country should be divided into areas, each in charge of a committee. The I.M.E.A. proposal is that the thirteen areas in which District Joint Industrial Councils already operate would be a suitable arrangement. The committees would consist of from ten to fourteen elected members, of whom at least half would be technical engineering representatives.

It would be the duty of these committees to consider and make recommendations to the Commissioners upon the conduct of all undertakings within their areas and upon representations from local authorities, other bodies and individual consumers. The question of purchase rights would come within the committees' purview.

Rural Electrification

Rural electrification would be another matter falling into the province of the committees, and in this connection the annual report contains a somewhat equivocal phrase: "The development of uneconomic rural areas to ascertain whether their development is desirable." Later it is recommended that financial aid should be given in the case of uneconomic areas when their development is considered to be in the national interest. Where the price of a bulk supply to an authorised undertaking exceeds the grid tariff the Electricity Commission would be empowered in "approved cases" to make an appropriate grant.

An endeavour to secure greater uniformity in bulk supply charges would be another of the committees' tasks, and not the least difficult, we think.

The cost of the committees' operations would be met by means of a levy on the authorised undertakers in each area.

The Electricity Commissioners' powers would be extended to enable them to confirm by order, modify or disapprove recommendations by the area committees and to make rules with respect to the question of financial aid for undeveloped rural areas. A right of appeal to the Minister of Transport would be provided and his decision would be final except when one of the parties concerned in the transfer of an undertaking objected, when the Order made would be provisional only until confirmed by Act of Parliament. No undertaking would be transferred unless the Commissioners and the Ministry were satisfied that substantial and permanent benefit would accrue to the consumers of the transferred undertaking.

It remains to be said that Mr. De Renzi's Committee stressed the importance of showrooms, service, hire and hire-purchase of apparatus and assisted wiring. The I.M.E.A. proposals do not say anything about these matters. Presumably they

are details upon which the area committees would keep an eye. They are certainly most important details which some undertakings still neglect. This, then, is briefly the scheme put forward by the I.M.E.A. in anticipation of action by the Minister of Transport which the international situation and a possible autumn election are combining to postpone still further. What the company undertakings' views on the matter may be has yet to be made clear, but Mr. De Renzi claims that the I.M.E.A. proposals have received from them a "considerable measure of approval."

Cable Research

TO-DAY some kind of reliability equilibrium has been secured as between transformers and cables. That the two can now be treated as a single transmission unit in regard to switching provides a striking example of the value of the research that has been carried out on cables during recent years, since it was about fifteen years ago, during the height of the "tangential-stress" crisis, that one frequently heard the wish expressed that 33-kV cables were as dependable as the transformers associated with them. What is meant by research in the modern sense as it is carried out by cable manufacturers is well illustrated by the new high-voltage laboratory of Henley's described in this issue, where most of the work in hand seems likely to lead to practical results in the early future. This work is complementary to the main function of E.R.A., which is to investigate problems that generally do not yield such immediate results but which are likely to be no less fruitful because the dividend is likely to be deferred for some time.

The G.E.C. Report

DESPITE the difficulties of trading during the past year, which have been common to all electrical concerns, the General Electric Co., Ltd., is able to show a good profit in its report for the past year, and in view of the company's wide ramifications abroad, stockholders will read with comfort that the volume of overseas business has again increased and established a new record. The one exception is China, where, in view of the political troubles in that country, it is not surprising to learn that conditions have had an adverse effect upon trading. Import restrictions in New Zealand are also having a disturbing influence upon trade with that Dominion. The general political situation is partly responsible no doubt for the growing tendency of overseas countries to manufacture their own requirements, and in order to meet this new development the company is considering the establishment of factories in some territories.

Railway Telephones

So widespread a failure of railway telephones and telegraphs as was experienced on January 30th, due to severe snowstorms, which contributed to the cause of a collision between two trains near Hatfield, is fortunately rare, but the risk to life and the serious dislocation of traffic that it may involve makes such an occurrence of far greater moment than it would be in the case of a breakdown of Post Office communications. Lt.-Col. E. Woodhouse in his report to the Ministry of Transport rightly, we think, dismisses as impracticable any question of a wholesale substitution of buried cable for overground lines, which would call for the installation of costly equipment as well, in order to secure efficient performance over long distances. He suggests, however, that "storm-proof" circuits might gradually be introduced in localities where congestion would otherwise result or where there are tunnels. For the rest, modified block-working could be maintained with ordinary telephone instruments by the provision of single underground circuits for the relatively short distances covered by single block sections.

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The Object in View

EXPERIENCE with the Ljungström turbines at Brighton seems to have fully justified the enterprise of Mr. Clinch in installing larger sets of this type than had hitherto been made in this country with a view to securing quick starting from cold (or, more important still, perhaps, from a "semi-cold" state) coupled with a high degree of reliability and thermal efficiency. Satisfactory as the generating aspect is, however, Mr. Morley New only put the matter in its proper perspective when he emphasised at the inaugural function that it was but a means to an end—the end being to supply the greatest number of kWh to the largest number of consumers at the lowest possible price. With this dictum Mr. Clinch agrees, and as he has a chairman (Councillor F. G. Field) who holds very strongly that the surplus earned by the undertaking should be used to bring electricity within the reach of everybody, the results achieved at Southwick power station really should accrue to the benefit of the consumers in general.

An E.I.B.A. Appeal

EACH succeeding president of the Electrical Industries Benevolent Association has the laudable desire to beat his predecessor in establishing a record in the matter of subscriptions during his term of office. Mr. P. V. Hunter, this year's president, in addressing his appeal to all in positions of authority—directors, secretaries and others—to do what they can to see that their concerns subscribe adequately, also asks all those engaged non-manually in the industry to show their good will by joining personally as members of the Association. The objects of this worthy cause are too well known to need commendation from us, and we feel that we have only to draw our readers' attention to the president's appeal to ensure that the "shoal" of cheques which he anticipates will come rolling in. Incidentally, these should be sent to Mr. Hunter at the Association's offices, 6, Southampton Street, London, W.C.1.

Electrical Gatherings

AFTER a week's lull following the I.M.E.A. Convention two annual electrical functions are in progress this week. The I.E.E. is holding its Summer Meeting in Manchester and the Association of Mining Electrical Engineers is in occupation of Sheffield whence it is making visits to a number of manufacturing establishments. Reports of the two gatherings will appear in our next issue. Next week the Electrical Contractors' Association meets at Brighton. This year only one paper is to be presented but as it is in five parts and each part is full of interest the time allocated to it may be found inadequate. In fact, it may be said to be a guide to modern installation practice by five authorities on the branches with which they deal. We hope to deal with this and the presidential address next week. Our customary report of the proceedings at the Conference, with pictures taken by our photographer, will appear in our July 7th issue.

HIGH-VOLTAGE CABLE RESEARCH

Henley's Gravesend Laboratory

IN view of developments over the past few years in cables intended for operation at higher voltages, W. T. Henley's Telegraph Works Co., Ltd., decided to redesign the high-voltage part of its laboratory and testing station at Gravesend. The new plant is now in commission and we recently had an opportunity of observing how the results of fundamental research in other sections of the laboratory (e.g., physical and chemical) can be applied to experimental cables and tested under stringent practical conditions.

It is now about twenty years, as Sir Montague Hughman, chairman of the company, reminded us during our visit, since research on modern lines was started at North Woolwich, under Dr. P. Dunsheath. Responsibility for the laboratory is now vested in Mr. W. C. Barry and his deputy, Mr. T. R. P. Harrison, with a staff of approximately one hundred persons, who cover the whole range of Henley's various activities.

Exterior of the new building

The testing station, the dimensions of which are 105ft. by 132ft., is built on to the north end of the factory and comprises two main spans with a clear height of 40ft. to the roof trusses. While the testing transformers are on the test floor, all associated heavy switchgear, motor generators, and regulating equipment are housed in a separate machine room, the connections from which are taken by way of underground ducts.

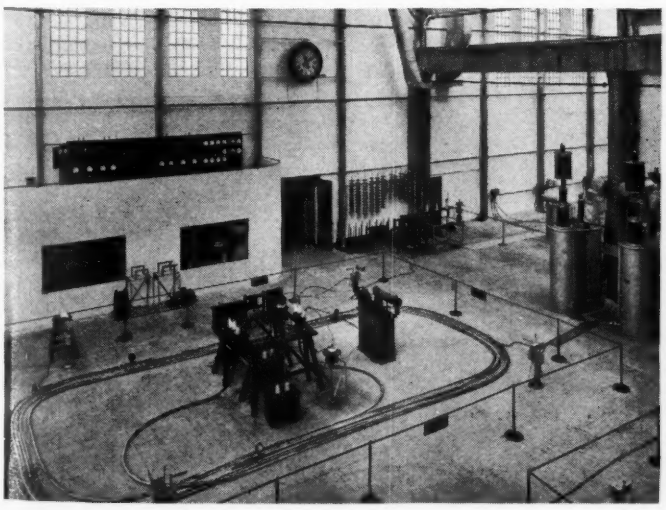
These two spans are operated independently. In the first there are three separate testing plants: a single phase 300-kV equipment for tests on cables requiring upwards of 100-kV, and two three-phase banks of 125-kV and 100-kV single-phase transformers. The 300-kV unit consists of a 1,000-kVA transformer fed at 3-kV at either 25 or 50 cycles, with primary windings divided into two sections for series-parallel operation to give easier control under heavy cable load at the lower voltages of its range. It has been designed as the second unit of a 600-kV cascade group, but the tank is at present only lightly insulated from the floor for power-factor testing.

In order to permit of accurate measurements of power factor, especially with buried cables with lead sheath earthed, the primary and tertiary windings are surrounded by a metallic screen, and the secondary winding is separated from the primary by a similar screen. The function of the 600-V tertiary winding is to operate a kV meter on the control desk. Protection is afforded by a choke coil shunted by a high resistance on the high-voltage terminal. The low-voltage end is brought out to a lightly-insulated terminal, between which and the tank a high-frequency protective device has been fitted.

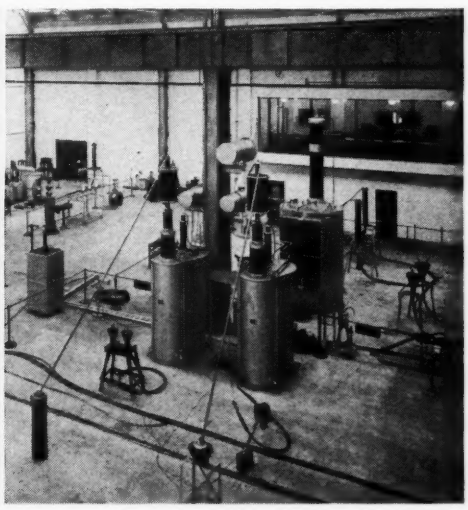
Supply is obtained from a 3-kV, 1,000-kVA single-phase sine-wave alternator driven by a 440-V three phase auto-synchronous motor. The alternator winding is in four sections, for series, series-parallel, and parallel operation, to secure stability at low voltages and heavy leading loads.

Two motor speeds for giving 25 and 50 cycles are obtainable by pole-changing by means of an off-load operated drum controller. Field currents for the motor and the alternator are provided by two exciters, which in turn are excited by a pilot machine, the whole being driven by a separate motor. A double-barrelled rheostat in the alternator-field circuit forms the main control of the high-voltage output of the testing transformer.

The 125-kV plant comprises three 100-kVA single-phase transformers with windings and protective



Cable joint tests with cold-filling compound



Double-insulated 125-kV testing transformers

arrangements similar to those of the 300-kV unit. They can be transported by means of a 20-ton electric crane. Their input is obtained from the 440-V three-phase town supply *via* three motor-driven 0-440-V inductor regulators; as the latter are double-wound, one side of the secondary (star) windings can be earthed. The primaries of the regulators are controlled by three double-pole single-phase 700-A oil-circuit breakers forming part of a remote-operated switchboard, which also includes a similar triple-pole three-phase breaker on the incoming supply and a link board to which the transformer primaries, regulator connections and switchgear terminals are connected, for either single or three-phase operation of the plant. When a link is inserted a push-switch behind it makes contact, causing a lamp on an indicator diagram in the control room to light up.

In the third testing plant each 100kVA transformer has both windings in two sections, this arrangement on the secondary side allowing the whole output to be utilised at a voltage of 50 kV to earth. There is an earth shield between primary and secondary windings; voltage measurement is by a tapping on the secondary. Protective devices are fitted to the high-voltage terminals. A 440-V 300-kVA three-phase moving-coil regulator, fed from the town mains, and motor driven, is connected direct to the three transformers and gives uniform voltage variation. The switchgear for this plant consists of remote operated three-phase contactors.

Control Room

The control room for this span measuring 48ft. by 17ft., and raised 12ft. above the test floor, has three sides glazed. In the centre and at each end are the control desks for the three plants, and on the wall behind the corresponding relay panels. In the middle of the room facing the back wall is a sloping desk, 14ft. long, containing the testing bridges, the galvanometers being attached to the back wall in anti-vibration mountings; on the desk are a high-voltage Schering bridge and valve amplifier, two Kelvin bridges (one for resistance and the other for conductor-temperature measurement) and a dielectric resistance set.

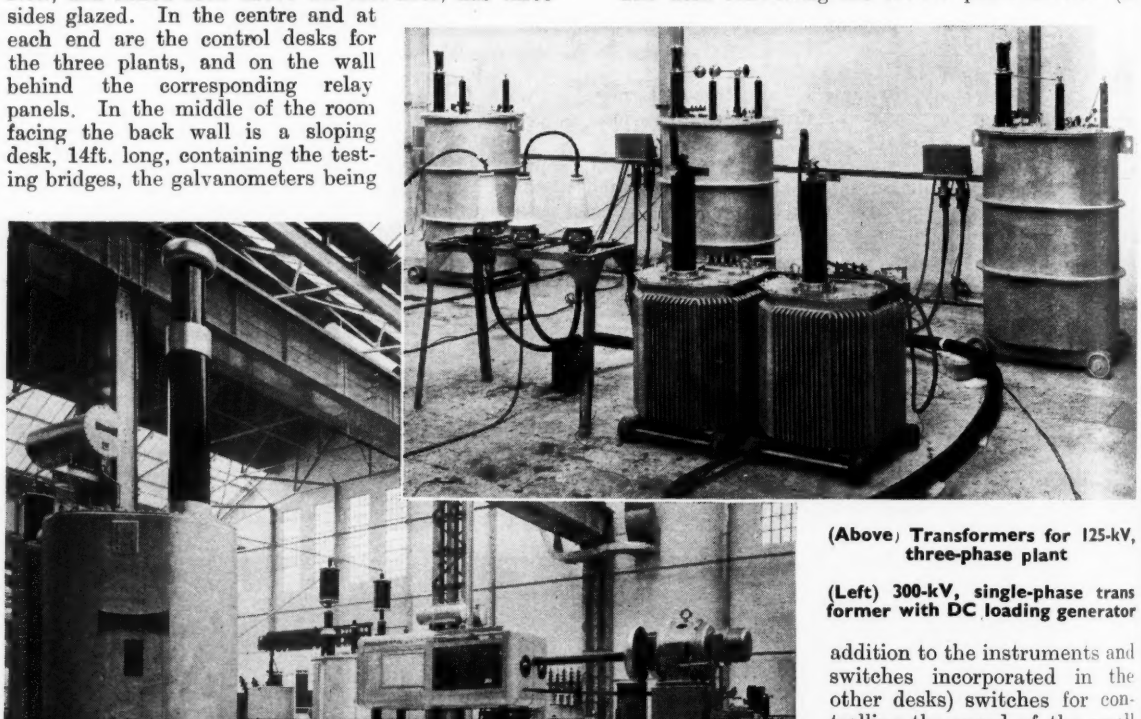
A cubicle disposed centrally on the test floor contains solenoid-operated switches to control nine leads by means of which any part of a sample undergoing a long time test can be connected by one set of leads to the Schering bridge. Selector switches on the desk enable the power factor to be measured without altering any connections on the test floor. Unless a sample is connected to the bridge the leads are automatically earthed; this also happens if the supply to the solenoids fails. The dielectric-resistance and conductor-resistance leads are also taken to the cubicle.

On the desk controlling the largest plant are instruments indicating the input voltage and current, kV on the secondary winding of the transformer, and frequency, while a self-starting synchronous clock measures the duration of the test. Red and green lights show the position of the main circuit breaker, and a yellow light comes up when interlocks are complete, and the circuit breaker may be closed. There are also switches on separate circuits for closing and tripping the main circuit breaker, and a key-operated safety switch to prevent unauthorised re-closing. A night switch ensures that in the event of a cable failure all running machinery will be shut down. Three push buttons operate the motor of the alternator field rheostats.

On the wall is a relay panel on which are overload and wattmetric relays providing both over-current and over-power protection. The voltmeter windings of the wattmetric relays are fed from a small alternator on the end of the shaft of the main motor generator.

From the desk in the centre controlling the 125-kV plant an unobstructed view is obtained of the whole test floor. The general arrangement of instruments and switches is like that of the 300-kV plant, allowing for three instead of one transformer. There is also a diagram showing by illuminated slits the position of the links on the switchboard in the machine room.

The desk controlling the 100-kV plant includes (in addition to the instruments and switches incorporated in the other desks) switches for controlling the speed of the small motor moving the coil of the three-phase regulator. Three tapped current transformers in the machine room operate a triple-pole overload relay which is provided on the control desk.

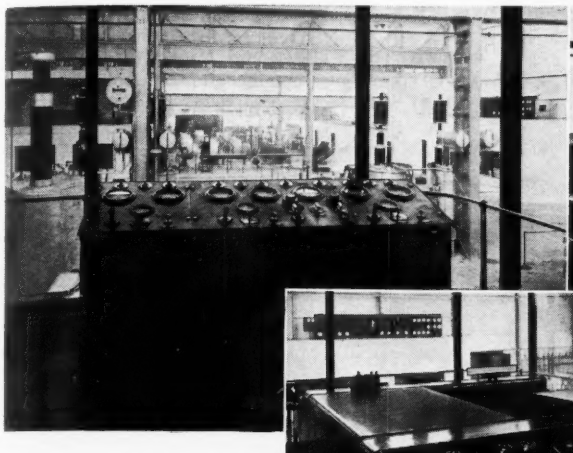


(Above) Transformers for 125-kV, three-phase plant

(Left) 300-kV, single-phase transformer with DC loading generator

Although the second span is somewhat larger than the one described above, it includes only one high-voltage plant. This consists of four 125-kV, 150-kVA single-phase transformers with two-section primaries and with their secondaries terminating in two bushings, one 125-kV and the other 250-kV, so that four units may be coupled in series with middle point earthed to give 500 kV. To obtain heavy loads up to 125-kV, the four transformers can be run in parallel. The

transformers are unscreened and the tanks permanently earthed. A tap is brought out of the secondary winding at one-thousandth of the number of turns for voltage measurement, and each high-voltage terminal is fitted with a protective choke coil.



Control desk for 125-kV, three-phase plant

Test desk with safety selector panel (in background)

Control room ; power factor tests in progress

The eight-panel switchboard serving this plant is in a gallery above the test area adjacent to the machine room. It comprises four switching, two interconnecting, and machine and regulator control panels.

Current for this plant is provided by a 250-kVA 500-V single-phase alternator driven by a 500-V DC shunt motor, the speed of which can be varied to produe any frequency from 25 to 60 cycles. The alternator field is supplied from a 110-V exciter driven by an induction motor, and its strength can be adjusted by a motor-driven potentiometer. Input voltage to the main transformers is altered by four moving-coil regulators.

The control room for the second span is designed upon the same lines as that for the first, but is only 24ft. long by 14ft. wide, and has one staircase instead of two. The remote controls for the high-voltage transformers are built into the desk which houses the Schering bridge, and the operator taking power-factor measurements can control the voltage to the testing transformers by means of remote control of the regulator motor and of the alternator field potentiometer. The circuit breakers on the switchboard are opened by multiple trip, but they cannot be closed from the control room.

On another desk is a dielectric resistance set and a vernier potentiometer for the measurement of conductor resistance. In the centre of the rear wall is a safety selector switchboard identical with that in the larger control room. The testing leads for this equipment are permanently connected to the various bridges as most of the testing is of a short-time routine nature.

Ensuring Safety

One very clear impression left of the layout of the testing plant is that of its extreme flexibility. This is largely due to a departure from the conventional practice of having a number of screened-off sections, entrance to which is obtained through gates with safety interlocks. The method adopted at Gravesend is to surround each area (normally three in each span) with a beam of light, which may be up to 40 yd. in length, thrown from portable standards at the four corners on to a selenium cell. Interruption of the light rays for 1/20 sec. by anyone passing beyond a simple horizontal bar shuts down the supply to the area. Clear indication is given in the control rooms of the electrified areas.

For carrying out long-time stability tests on buried cables in addition to applying excess voltage between conductors and lead sheaths, heavy currents at low voltage are required for conductor heating. For this purpose three 22.5-kVA loading transformers have been installed with an output of 750 A at voltages up to 30-V single phase. Their primary windings are in four sections for ready connection for series-parallel working and are fed at a variable voltage up to 440-V obtainable from 22.5-kVA single-phase induction regulators.

Avoiding Heating Effects

Where the heating effects of induced currents in the lead sheath must be avoided, DC from a 15-kW generator with two 15-V 500-A windings for connection in series or in parallel, is used. The generator with its exciter is housed in a metal cage fixed on an insulated pedestal and there is said to be no corona at 300- kV to earth, and very little even at 450 kV. It is driven through an insulating shaft by a 25-h.p. motor which is mounted on a steel pedestal. The field of the exciter is regulated by insulated rods.

We noticed a 132-kV gas-cushion cable on long-time stability test, the greater proportion of which was laid underground, but with a loop hung vertically from the outside wall (as is the practice when testing any cables here), to ascertain drainage performance. The small diameter of an exposed joint and the immediate automatic registration of "faults" at the control point were notable features.

Lighting in the test areas is a mixture of ordinary and fluorescent mercury-vapour lamps, but in both control rooms tungsten lamps fed from the DC system are used to avoid risk of interference.

A point that may be mentioned is the method of earthing the neutral on the 440-V side of the 1,000-kVA transformer stepping down the 6.6-kV of the factory ring main. The earth connection is taken through a trip coil shunted by a 5-A fuse, and in the event of the earth current exceeding 10 A, the whole AC supply is cut off.

The following were the principal contractors for the plant:—Ferranti, Ltd. (cable-loading generator and transformers, testing transformers and moving-coil regulators); British Thomson-Houston Co., Ltd. (6,600/400-V supply transformer and exciter set); Newton Bros. (Derby), Ltd. (motor-generator and exciter sets); Ferguson, Pailin, Ltd. (6,600-V and l.v. switchgear); Erskine, Heap & Co., Ltd. (l.v. switchgear); Switchgear and Cowans, Ltd. (induction regulators); Radiovisor Parent, Ltd. (light-ray protection standards); H. W. Sullivan, Ltd. & H. Tinsley & Co. (cable-testing equipment).

ARC WELDING TRANSFORMERS

Distribution of Load over Three Phases

By H. A. W. Klinkhamer* and W. O. Julius, M.I.E.E.

MANY electricity supply engineers have strong objections to the use of a single-phase arc-welding transformer on their supply mains because it loads only two of the three phases, is very erratic, has a bad power-factor and may cause serious flicker in lights fed from the same main. Manufacturers of welding plant have attempted to meet these objections partly by applying the principle of Scott-connected transformers as in fig. 2, fig. 1 representing the conventional single-phase connection.

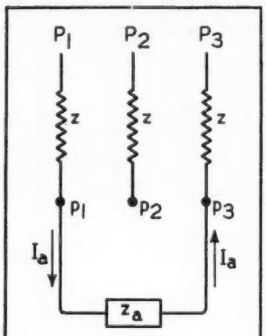


Fig. 1

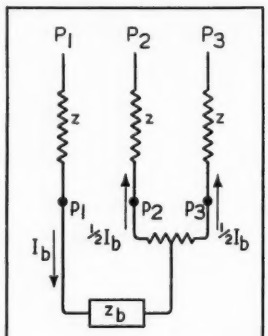


Fig. 2

Other authors have already pointed out that none of these solutions assists in reducing the maximum current taken from any one phase or improves the real balance of the three-phase system, all calculations being based on the use of transformers with a given open-circuit secondary voltage and given welding conditions.

An aspect which, as far as our knowledge goes, has not been investigated is the question of a comparison between the maximum voltage variation between phase and neutral (important when considering flicker of light) as a result of the load provided by a single-phase transformer and that by the so-called phase-balanced equipment. The purpose of this article is to examine the latter problem.

The following abbreviations are used to represent vectors:— P_1, P_2, P_3, and p_1, p_2, p_3=mains voltage, exclusive and inclusive of voltage drop, between phase and neutral; z=impedance of mains, including transformer feeding the distribution network; z_a, z_b=impedance of welding transformer; I_a, I_b= primary current of welding transformer. It is assumed that mains voltage variations are small, *i.e.*, z is small compared with z_a and z_b.

The voltage increases at the point of the load are: in fig. 1, $p_1-P_1=-I_az$, $p_2-P_2=0$, and $p_3-P_3=-I_az$; in fig. 2 $p_1-P_1=-I_bz$, $p_2-P_2=-\frac{1}{2}I_bz$, $p_3-P_3=-\frac{1}{2}I_bz$.

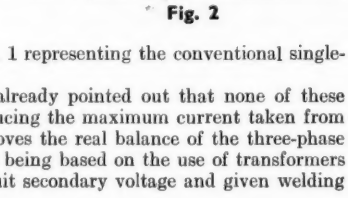


Fig. 3

Calling E_{1a}, E_{2a}, E_{3a}, E_{1b}, E_{2b}, E_{3b} the relative alterations of the phase-to-neutral voltages (negative for decreases and positive for increases) we find that $E_{1a}=\frac{p_1-P_1}{p_1}$, &c. In view of our assumption that the voltage alteration is small compared with the mains voltage, we may modify these formulæ to the approximate equations: $E_{1a}=\frac{p_1-P_1}{P_1}$, &c.

The primary voltage of the welding transformers is represented in fig. 3 by the line $P_3\ P_1=P_1-P_3$ for the scheme according to fig. 1 and by $A\ P_1=3/2\ P_1$ for that of fig. 2. The primary currents can now be found from the following equations: $I_a=\frac{P_1-P_3}{z_a}$ and $I_b=\frac{3/2\ P_1}{z_b}$. Since the primary kVA must be the same in both cases and the primary voltage of case (*a*) is $\frac{2}{\sqrt{3}}$ times that of (*b*), z_b must be equal to $\frac{3}{4}z_a$.

We now find: $E_{1a}=\frac{p_1-P_1}{P_1}=\frac{-I_az}{P_1}=\frac{-P_1+P_3}{P_1}\times\frac{z}{z_a}$

$$=\left(\frac{P_3}{P_1}-1\right)\frac{z}{z_a}$$

and similarly: $E_{2a}=0$, $E_{3a}=\left(\frac{P_1}{P_3}-1\right)\frac{z}{z_a}$, $E_{1b}=-2\frac{z}{z_a}$,

$$E_{2b}=\frac{P_1}{P_2}\frac{z}{z_a}\ \textit{and}\ E_{3b}=\frac{P_1}{P_3}\frac{z}{z_a}$$

Calling β the angle between the directions of z and z_a, then $\frac{z}{z_a}=a\ (\cos\beta+j\ \sin\beta)$ in which a is a real constant. Furthermore

$$\frac{P_1}{P_2}=\frac{P_3}{P_1}=-\frac{1}{2}-j\frac{1}{2}\sqrt{3};\quad \frac{P_1}{P_3}=-\frac{1}{2}+j\frac{1}{2}\sqrt{3}\ \textit{and}$$

$$\textit{thus}\ E_{1a}=\left(-\frac{3}{2}-j\tfrac{1}{2}\sqrt{3}\right)a\left(\cos\beta-j\ \sin\beta\right)=\frac{1}{2}a\times$$

$$\left(-3\cos\beta+\sqrt{3}\sin\beta-j\sqrt{3}\cos\beta+j3\sin\beta\right)\ \text{and similarly}$$

for E_{2a}, &c.

The projection of the voltage alterations on the vectors p_1, p_2 and p_3 or, with the same approximation as adopted earlier, the projection of the voltage alterations E_{1a}, &c., on the vectors, P_1, P_2, P_3 represents the absolute value of the voltage alterations of these phase-to-neutral voltages (lamp-load voltages). This means that the real part e_{1a}, e_{2a}, e_{3a}, e_{1b}, e_{2b}, e_{3b} of E_{1a}, &c., indicates the effective relative value of the alteration of the phase-to-neutral voltages.

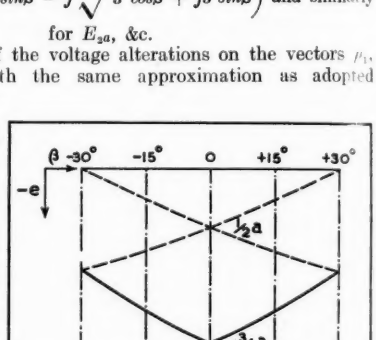


Fig. 4

Thus we find that $e_{1a}=\left(-3\cos\beta+\sqrt{3}\sin\beta\right)\frac{1}{2}a$,

$$e_{2a}=0,\ e_{3a}=\left(-3\cos\beta-\sqrt{3}\sin\beta\right)\frac{1}{2}a,\ e_{1b}=$$

$$\left(-4\cos\beta\right)\frac{1}{2}a,\ e_{2b}=\left(-\cos\beta+\sqrt{3}\sin\beta\right)\frac{1}{2}a\ \text{and}$$

$$e_{3b}=\left(-\cos\beta+\sqrt{3}\sin\beta\right)\frac{1}{2}a$$

In actual practice z will be largely inductive, because of the characteristics of the mains transformer feeding the network. The angle over which z will be lagging by the mains voltage will certainly be between 30° and 90°. In most cases z_a and z_b will be lagging by about 60° ($\cos\phi=0.5$). Examining, therefore, the region of: $-30°<\beta<+30°$ we will certainly cover all cases which may be met with in practice.

Fig. 4 represents graphically the equations for e_{1a}, &c., for this region. In this figure the continuous lines refer to the voltage alterations in the single-phase case (*a*) and the dotted lines to those in the "balanced" case (*b*), and it will be clear that the so-called "phase-balanced" system causes larger fluctuations in one phase than the single-phase connection.

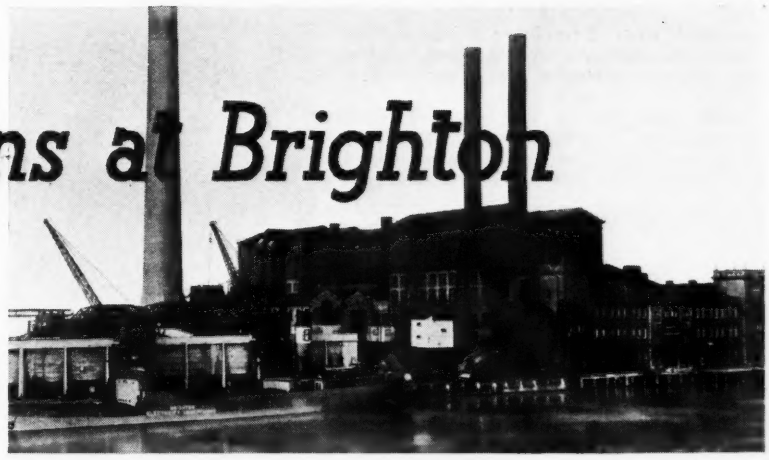
*Of the Philips Research Laboratories.

I.E.E. (North-Western Students)

THE summer visit of the North-Western Students' Section of the Institution of Electrical Engineers will be held on July 8th, when a visit will be paid to the works of Brookhirst Switchgear, Ltd., Chester. Particulars can be obtained from Mr. R. M. A. Smith, hon. secretary, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.

Extensions at Brighton

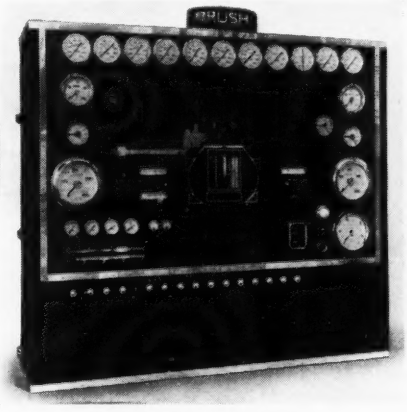
New boiler plant and a second 37,500-kW Brush-Ljungstrom turbo-generator



A SECOND 37,500-kW Brush-Ljungstrom turbo-alternator was inaugurated at Southwick power station on Monday by the Mayor of Brighton (Coun. J. T. Nanson), bringing the total installed capacity there up to 140,000 kW.

Steam for this set is raised in two high-head sectional-header boilers, each thirty-two sections wide with a seamless forged drum of 54 in. diameter and 2⅜ in. shell thickness fitted with steam scrubbers. Each unit has a heating surface of 8,040 sq. ft. and is rated at 175,000 lb. per hr., with a continuous maximum evaporative capacity of 215,000 lb. Steam conditions are 675 lb. per in. and 875 deg. F., rising to 900 deg. at maximum rating. A slag screen is formed of the lower rows of the section tubes, which are 4 in. by 22 ft. long, and a water-tube baffle separates the path of the gases from the superheater zone and convection heating bank, the latter having a heating surface of 11,500 sq. ft.

The furnaces are of the hopper-bottom type consisting of 3¼-in. tubes on 6 in. centres, expanded into manifolds connected to the drum so that the water fed to these walls is recirculated to the drum as part steam and part water. On the furnace side these tubes are covered by cast-iron blocks, which in the zone of combustion have a refractory force to give a high temperature for quick ignition, but the upper part of the furnace and the hopper bottom are lined with plain cast-iron blocks to prevent adhesion and to permit the solidification of ash discharged from the bottom of the furnace. The clinker and ash are discharged to refractory lined hoppers from which they are removed periodically by water jets and conveyed to storage hoppers.



Gauge and instrument panel for the new turbo-generator

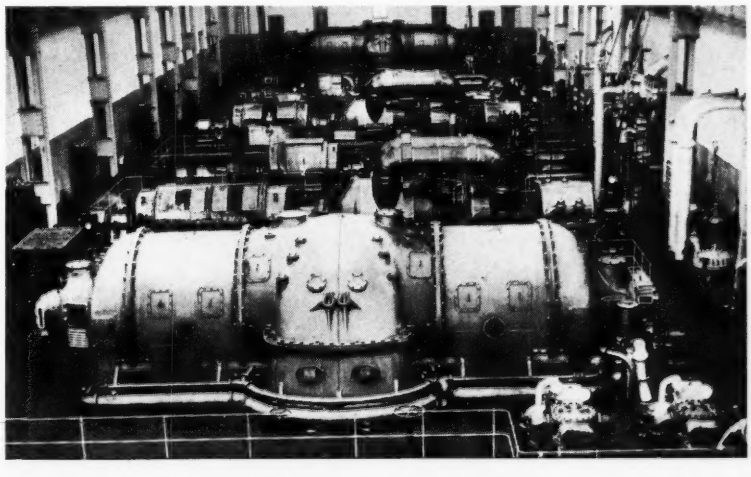
Two 6-ton pulverisers receive the coal for each boiler after it has passed through 5-cwt. automatic weighing machines and feeders of the rotating-table type which deliver the fuel over the top of an upper spring-loaded stationary ring into the centre of the mill, where centrifugal force drives it over a single row of balls in a race on a lower rotating ring. The two-speed feeders are driven by ⅜-¾ HP motors.

Primary air, admitted to the mill from the secondary air duct, lifts the crushed coal into the upper part of the mill and that which is of suitable fineness travels to the burners, the quantity being determined automatically by the amount of air. A 90-HP 1,460-RPM motor drives the primary air fan direct and also the mill through a Texrope. Some 10 kWh is consumed per ton of fuel ground at the rated capacity of the mill. Each of the four burners per boiler can deal with half the maximum output of one mill. For lighting up, two compressed air oil-atomising units with rotary pumps per boiler are installed.

After leaving the furnace the gases pass through two 37,500-sq. ft. regenerative preheaters, which raise the temperature of air for combustion to 550 deg. F. and reduce the temperature of the exit flue gases to 240 deg. at normal loads. The next stage is an electrostatic precipitator (one per boiler) in which the gases pass upwards through nests of tubes in the middle of which are electrodes charged at from 45 to 55 kV by means of unidirectional current obtained via a full-wave rectifier rated at 60 kV. Two sets serve the two precipitators, but either can deal with the full duty if necessary.

Between the precipitators and the brick chimney (254 ft. high with a minimum internal diameter of 18 ft.) come the induced-draught fans, two per boiler, which are driven by two-speed 137-87-HP motors at 725-580 RPM. The forced-draught fans, also two per boiler, are single-speed with 54-HP 970-RPM motors. Two multi-stage centrifugal feed pumps driven by 8,000-V, 585-HP induction motors have been installed with a similar steam pump as stand-by. Make-up water is obtained from a triple-effect evaporator.

Instrument panels of the cubicle-desk type provide the control system for the boilers. Each panel includes a steam- and air-flow meter, feed-water flow meter, ten-point draught gauge, Negretti and Zambra electrical resistance temperature indicator (steam, water and gas), a Radiovisor smoke density indicator, a Cambridge CO_2 recorder, feed and steam pressure gauges, remote controls for fans and coal feeders, Tate damper controls, push-buttons for mill motors, and Lockheed-Babcock controls for mill dampers. In addition, mounted on the turbine-house wall is a 12-in. scale feed - water - flow Venturi meter.

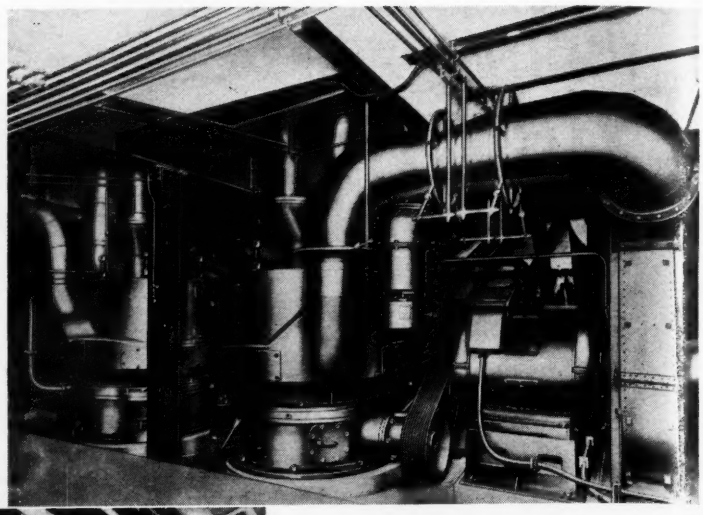


Interior of Southwick station with the new 37,500-kW Brush-Ljungstrom set in the foreground

The turbine, which runs at 1,500 RPM in each direction, incor-

porates 57 rings of radial-flow blading and two axial-flow single-rotation low-pressure stages, for which a double-flow arrangement is employed.

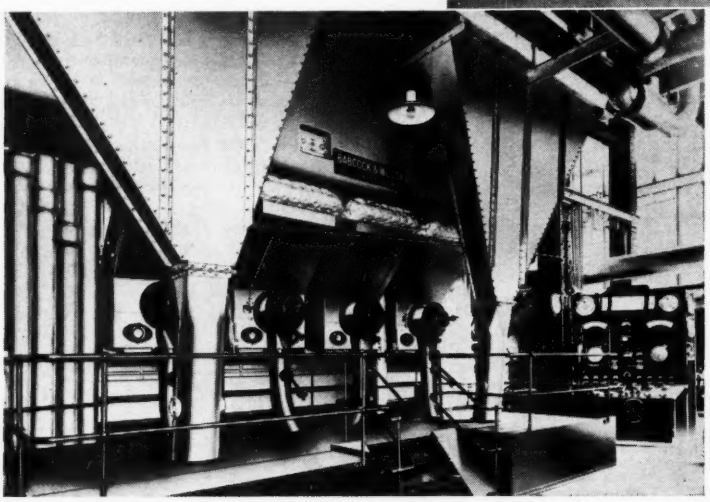
Each disc carries two rows of axial blades as well as radial-flow rings. Four rows of stationary blades are carried in a frame built up of steel plates and supported in a central



Two of the four 6-ton pulverising mills

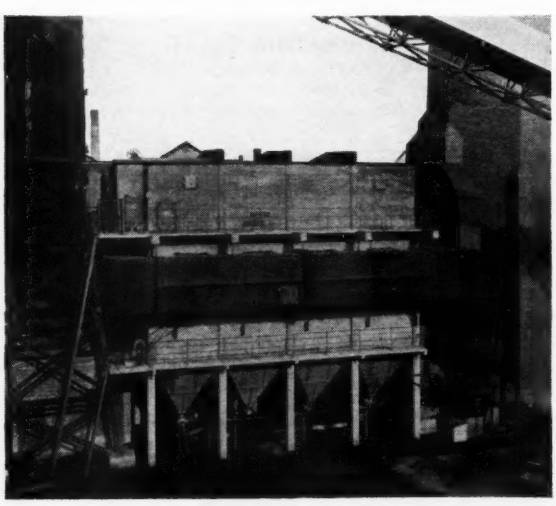
position in the turbine casing. The complete blade system is contained in an unlagged l.p. casing, which is exposed only to the temperature of the exhaust steam.

Steam at most economical loading passes from the inner compartments of the steam chests situated one on each side of the blade system to the inside of the first ring through holes in the hub of the discs. A second connection from each chest admits steam to lower pressure stages to give the maximum rating. Other still lower pressure points are provided



for bleeding steam for the HP and LP feed heaters. The turbine casing is directly supported by the inlet flange of the condenser.

The two 8-kV alternators have their stator windings permanently in parallel and their rotor windings in series. They are connected by step-up transformers to the 33-kV bus-bars in the grid sub-station. The overall length of the whole set is 45 ft. 3¾ in.



Sturtevant electrostatic precipitator

A divided two-pass condenser with a total surface of 37,100 sq. ft. is designed to maintain a vacuum of 29 in. at 30,000-kW loading when supplied with 31,000 gal. per min. of cooling water at 60 deg. F.

Duplicate vertical-spindle extraction pumps are capable of lifting 550 gal. per min. against a total head of 131 ft. at the suction of the l.p. feed pumps; they are driven by 55 HP-DC motors at 1,000-1,130 RPM. An arrangement for gradually and automatically unloading the turbine as the vacuum falls below 24 in. Hg. takes the place of the usual form of atmospheric exhaust valve. Vacuum is maintained by a three-stage air ejector with inter and after condensers for circulating the

New B. & W. boiler plant

main condensate passing from the extraction pump to the first-stage feed-heater. A stand-by ejector with inter-condensers arranged for sea-water circulation is also installed. For quick starting, a further ejector able to raise a vacuum of 24 in. in three minutes has been provided. An additional c.w. pump with a duty of 32,000 gal. per min. and driven by a 450-HP 8-kV squirrel-cage motor has been installed.

Near the turbine an instrument panel to the design of Mr. Clinch is inlaid with a mimic diagram showing the fuel-heating, lubricator and other systems. Push buttons enable pressures and temperature at all important points to be read on indicators, including those of the inlet and outlet of the circulating water and ventilating air.

A two-hour test on the plant, loaded at 30,254 kW, was taken by Mr. W. M. Selvey. The result, corrected for departure from guarantee conditions, gave a steam consumption of 8.632 lb. and a heat consumption of 9,759 BThU per kWh.

It was officially stated that within five minutes of its inaugural lighting up one of the boilers was generating at the rate of 25,000 lb. of steam per hr. and that the turbine was switched in within four minutes of starting from cold. The capital cost of the extension was £457,000.

The whole of the work was carried out to the specification and under the supervision of Mr. W. N. C. Clinch, electrical engineer and manager.

The principal contractors for the extensions were Babcock & Wilcox, Ltd., for the boiler plant, and the Brush Electrical Engineering Co. for the turbo-alternator. Other main contractors were: Aiton & Co., Ltd., c.w. equipment and evaporators; Ash Co. (London), Ltd., ash-handling plant; Bierrum & Partners, Ltd., buildings; J. Blakeborough & Sons, Ltd., c.w. valves; Dewrance & Co., Ltd., pressure gauges and safety and other valves; Dicks Asbestos Co., Ltd., lagging; Dorman, Long & Co., Ltd., structural steel work; Glenfield & Kennedy, Ltd., c.w. valves; Henry Hartley & Co., Ltd., buildings; Mather & Platt, Ltd., feed and c.w. pumps; Metropolitan-Vickers Electrical Co., Ltd., electrical equipment; P. C. Richardson & Co. (Middlesbrough), Ltd., chimney; Siemens Bros. & Co., Ltd., cables; Stanton Ironworks, Ltd., c.w. equipment; Stewarts & Lloyds, Ltd., steam and feed pipework; G. & J. Weir, Ltd., ejectors, f.w. heaters and steam-driven feed pump. Other contractors included Allen West & Co., Ltd., electrical equipment; Alley & MacLellan, valves; Automatic Products Co., Ltd., Lockheed-Babcock controls; W. & T. Avery, Ltd., automatic weighing machines; Bailey Meters & Controls, Ltd., boiler instrument panels; Copes Regulators, Ltd., f.w. regulators; Crompton Parkinson, Ltd., motors; Drysdale & Co., Ltd., extraction pumps: Electroflo Meters, Ltd., instruments; English Steel Corporation, boiler drums; General Electric Co., Ltd., various equipment; Geo. Kent, Ltd., instruments; Heenan & Froude, Ltd., air coolers and ducts; Hopkinsons, Ltd., feed and check valves; Keith Blackman, Ltd., primary-air fans; Lancashire Dynamo & Crypto, Ltd., motors; Laurence, Scott & Electro-Motors, Ltd., motors; Renold & Coventry Chain Co., Ltd., sundry items; Richardsons, Westgarth, Ltd., float-feed valve and control; Sturtevant Engineering Co., Ltd., electrostatic precipitators; Worthington Simpson, Ltd., compressor.

MAINTENANCE WORK

Repairs and Reconditioning by Welding

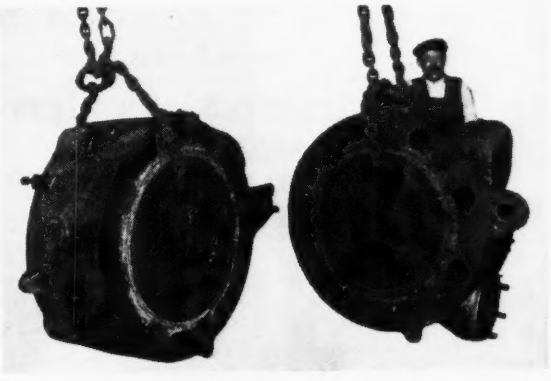
By C. W. Brett

STRIKING progress has been made during the past twelve months in the development of new welding processes, designed not only to cope with difficulties previously regarded as insuperable, but also to reduce the time required by the welding operator. Some of the special apparatus and new methods of procedure which have been devised are likely to have a wider field of usefulness than that of maintenance work, although the importance of the latter can hardly be over emphasised.

Electric and oxy-acetylene welding are not in competition, for each has its own sphere. Electric welding is, however, becoming the more important for manufacturing work and there would seem to be no limit to its scope.

Until the autumn of 1938 it had been regarded as virtually impossible to weld together metals having a different coefficient of expansion, but a few months ago a process became available that enabled steel and cast-iron to be successfully united by fusive means.

A combination of cast iron and steel in a single unit is likely to solve some of the problems with which a designer is faced, with special reference to the cost of production. For example, in the case of Diesel generating sets it has been found advantageous to weld steel bearing housings into a cast-iron crankcase, thus obtaining increased support and stiffness without adding to the weight of the casting.



Two Diesel-engine cylinder heads, cracked between the air, fuel and exhaust ports; burned metal was cut out and the cracks welded

The utility of maintenance work carried out on fusive lines does not end with the reconditioning of broken items of plant. Indeed, a large proportion of the jobs in hand at a fusive-repair works are not due to breakage but normal wear and tear.

Worn Bearings

The simplest instance in this building-up class of work is that of steel shafting which has become scored and worn in a bearing. To skim the shaft is often undesirable, particularly when the margin of safety is small. In cases of this kind the welding engineer fuses steel upon the defective places and frequently this new material is better qualified to resist wear than the original. Subsequent grinding restores the shaft to its designed limits, although in certain instances, particularly in the case of generating set crankshafts, an oversize finish is specified, so that after a further long period of service a re-grind alone is necessary to restore the shaft to its primary dimensions. Variations of this process are often used when riveted construction has either failed or been found inadequate for the duty required.

Fusive maintenance work calls for great skill on the part of the operator, irrespective of the equipment he may be using, but until quite recently when steel was ground to a mirror finish after welding, almost invariably pit marks were evident. Although these did not detract from the strength of the repair, nevertheless they were usually sufficient to mar the perfect surface required of a heavily loaded bearing.

This phenomenon was due to the affinity of the oxygen in the atmosphere for the molten metal, but nowadays when steel is to be welded and then machined the point of fusion is enveloped in hydrogen until the repair is completed. The strength of work carried out in this manner is very great, and the method is frequently used with complete assurance of success for re-uniting crankshafts which have broken, usually across a web. Although some of these measure up to 16 ft. in length no case of a second failure has been recorded, but in one instance a shaft broke a second time at a point remote from the weld and investigation showed the cause to be due to a flaw in the forging, which was not disclosed at the time of the first failure.

There are two methods of supplying the hydrogen. The first is from high-pressure cylinders, and the second is by the use of specially coated welding rods which emit the required volume of hydrogen directly they are heated in the normal course of the work. This system is particularly useful when compressed hydrogen is not available.

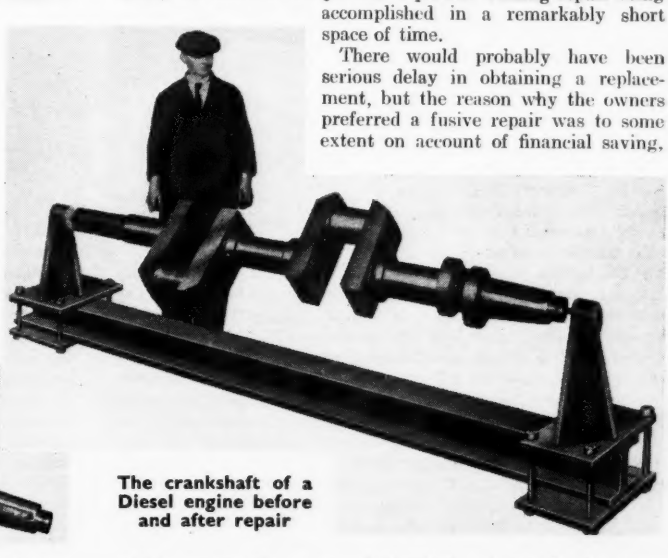
There is no alloy in commercial use to-day which cannot be welded successfully, but unfortunately for electrical applications in particular, copper presented certain difficulties. All of these have now been overcome and the extended use of welded copper has many possibilities.

Damaged Hydraulic Press

A significant example of the manner in which metal of unusual thickness is now being welded occurred recently in connection with the fracture of the head of a 1,000-ton hydraulic press used for the lead covering of large electric cable. Without preliminary warning the head broke across the centre into two pieces of almost equal size, and having a combined weight of 15 tons.

In places the casting was fractured through metal 5 in. thick, but this did not prevent a perfect welding repair being accomplished in a remarkably short space of time.

There would probably have been serious delay in obtaining a replacement, but the reason why the owners preferred a fusive repair was to some extent on account of financial saving, which amounted to several hundreds of pounds, but more particularly because the welding engineers not only guaranteed their work, but pointed out that it was possible to make the head far stronger than it was originally. Subsequent tests not only proved that this was so, but also that the alignment had been strictly preserved. A few weeks later a second press in the same factory failed in the same manner and was similarly repaired.



The crankshaft of a Diesel engine before and after repair

The welding of cast and malleable iron parts has also under-

gone a highly important change. The time-honoured preliminary of pre-heating a worn or damaged component in a muffle furnace, has been largely discarded. This procedure is time-wasting and therefore expensive, for if the work involved occupied a considerable length of time, then the item concerned might have to be returned to the furnace four or five times before the operator could finish his task.

The use of special apparatus, together with a somewhat different technique on the part of the operator, has overcome this obstacle. Nowadays work can be commenced without pre-heating and in the certain knowledge that the heat generated in the process of fusion will be so restricted in its flow that stresses are not developed. Moreover, if welding operations are suspended momentarily, the metal may be touched close to the seat of repair without fear of sustaining a burn.

A further and less obvious advantage of this British process is that damage can often be repaired without prior dismantling, the only limitations being that accessibility must be reasonably good and subsequent machining unnecessary.

The various forms of electric resistance welding—spot, butt, seam and flash—now used so widely for repetition work are not entirely distinct processes, as some welding operations come under more than one of these heads and they all involve the same principle. Among other things, resistance welding has made possible the economical production of modern motor car bodies, and it is used very extensively in the manufacture and repair of electrical machinery.

This country is generally regarded as being pre-eminent in all branches of fusive repair work, and a considerable volume of business is handled for maintenance engineers overseas, including the United States. The magnitude of some of the work is such that it must be carried out on the site, and calls for the immediate dispatch of emergency equipment and operators. On the other hand, parts weighing up to 10 tons or so are usually transported to the shops of the welding engineer.

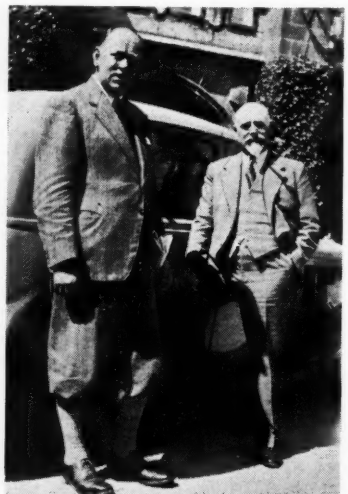
A greater knowledge of recent welding developments among maintenance engineers would save the needless scrapping of many valuable items of equipment or avoid the use of mechanical methods for repairs which are usually unsightly and often lacking in the permanency of fusive methods.

Scottish Contractors' Conference

Paper by New President

THE members of the Electrical Contractors' Association of Scotland assembled at Taymouth Castle, Perthshire, on June 2nd for the annual general meeting and week-end conference of the Association. There was a record attendance, the Castle not being able to accommodate everyone and the party overflowed into the Breadalbane Arms Hotel, Kenmore. On this occasion Mr. W. Riggs, the president of the English Association, and his daughter, Mrs. Bedford, joined the party. The gathering was favoured with perfect weather throughout.

The annual general meeting was held on Friday afternoon. The report showed the Association to be in a healthy state and that there had been a considerable increase in the membership during the past year. The following office bearers were elected: President, Mr. H. M. Speirs, B.Sc. (Glasgow); vice-president, Mr. H. A. Tait (Edinburgh); consultant and solicitor, Mr. W. Finlay, W.S. (Edinburgh); general secreary, Mr. M. P. Finlay, W.S. (Edinburgh). The new president was installed in the chair and a replica of the presidential badge was presented to Mr. R. Kilpatrick (Dundee), the retiring president. After tea a paper was submitted by the new president on the subject of "Electrical Contracting." Mr. Speirs said that not so long ago anyone might start practice as a wireman and in very short time emerge from the chrysalis stage to the status of a fully-fledged contractor with a quite inadequate knowledge of the more intricate details of his work. The requirements of present day contracting necessitated an arduous training, both practically and technically, in order that they might be well equipped to satisfy the requirements of their customers and the public generally.



Mr. R. Kilpatrick, retiring president with Mr. Walter Riggs, president of the E.C.A.

He could not countenance the position of the owner or the manager of a contracting firm not having a thorough knowledge of the work which his firm was carrying out. Compulsory registration, when it came into being, would to a very great extent relieve the difficulty of such an intolerable position. For the young man who intended to be a contractor, experience of manufacturing, supply and general contracting was essential. He should, however, not overlook the fact that organisation, office training and administration were very necessary for the satisfactory control of a contracting business.

No doubt in the future there might be an amalgamation of contracting businesses just as there had been in the case of supply and manufacturing, and he felt that such organisation might be for the benefit of all. It would lead to greater efficiency while at the same time giving a more satisfactory monetary return to those in the industry. When their Association was one hundred per cent. strong a greater control would be exercised over members to the benefit of all concerned. The National Register of Electrical Installation Contractors was working in the right direction to organise contractors technically. The work of this body would naturally be taken over in the event of compulsory registration.

Dealing with the technical aspect of contracting, Mr. Speirs pointed out that the trained electrical installation engineer should be capable of undertaking the erection and setting to work of all classes of electrical equipment, including any preliminary designing which might be necessary. He was a necessary adjunct to the manufacturer on the heavier side of electrical contracting. He was no longer a wireman but an installation engineer.

He had often wondered why so few students from universities and technical colleges chose installation work as their career. He felt that if they only knew how interesting electrical contracting really was, they would see more of these young men coming into their industry. He was endeavouring to bring this matter to the notice of college students through their professors, but these young men would not be attracted unless there were suitable openings in a better organised industry.

Mr. Speirs then dealt with the questions of administration and conditions of tender and staff and remarked in conclusion that with the improvement of standards it seemed that a large amount of reinstallation work would be necessary, and with the ever-increasing application of electricity a very large field lay before them.

A discussion followed in which many members took part. Strong support of compulsory registration of contractors was expressed.

The second paper, entitled "Commercial Agreements," was submitted by Mr. W. Finlay. This paper had been prepared to inform members of the Association how the various inter-association commercial agreements had evolved and how these agreements both strengthened the Association and benefited the individual members. He expressed the view that such agreements were most appropriate to be applied in the case of patented or price-maintained articles, and it was obvious that on the other side it was necessary to have a corresponding association, all of whose members manufactured a style of commodity which could be maintained against competition by outside manufacturers. The three agreements relating to cables, lamps and batteries were typical examples of collective bargaining. The conditions were not ideally satisfactory and the position had to be continually watched to see that both sides were honouring both the spirit and letter of the agreement involved.

On the Friday evening, after dinner, a dance was held in the banner hall. On the Saturday morning the usual golf match, East v. West, was played and on this occasion the East were successful after suffering defeat for several years, winning by twelve matches to seven. A successful putting competition was carried through which produced a substantial sum for the Association Benevolent Fund. Tennis and fishing were also popular. The party, numbering about 110, dispersed on Monday morning.

Organisations of the Industry—XV

The Electrical Research Association

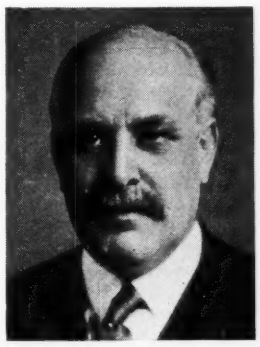
By E. B. Wedmore, C.B.E., M.I.E.E., Director

THE spirit of co-operation developed during the Great War led manufacturers to pool certain problems, establishing technical committees to deal with them, and to apply for financial aid from the Government which, at that time, was commencing to foster industrial research in the public interest. At the same time the I.E.E. took similar action in dealing with problems raised by the professional element.

The Government brought the two parties together and as a result the Electrical Research Committee was formed in 1917. In 1919 the Committee appointed the writer as technical officer and it became incorporated in 1920 as the British Electrical and Allied Industries Research Association with memorandum and articles based on the Government model for industrial research associations. Financial support was furnished by the B.E.A.M.A. and C.M.A. with Government assistance and it was due to their liberal help that the Association became an effective instrument and integral part of the electrical industry.

It was recognised that the proper sphere of activity of the E.R.A. (to use the popular abbreviation) was in problems of common interest for the solution of which no facilities existed elsewhere, and in problems which either required expenditure that would be unprofitable to an individual manufacturer because he could not retain sufficient of the benefit derived to reimburse himself, or required expenditure greater than he could afford.

It soon became evident that the problems of common interest were largely problems of user interest, problems which had been neglected for many years because they were nobody's business. In consequence the Association sought support from the electricity supply industry. The I.E.E. contributed £1,000 per annum, a handsome subscription indeed. Some of the larger supply undertakings offered support and finally, in 1928, with increasing realisation of their interest, the electricity supply undertakings shouldered the major financial responsibility, and have maintained this position ever since with continually increasing support, while the electrical manufacturers have supported the Association both technically and financially.



Above : Lord Stamp, President of the E.R.A., and Mr. A. E. Tanner, Chairman of Council

Below : Mr. A. Berkeley, Chairman of Finance Committee, and Mr. E. B. Wedmore, Director and Secretary

To-day all sections of the industry are to be found supporting the Association and an important liaison has been established with the Dominions and Colonies, notably Australia and India. The Association's income has risen to about £85,000 per annum and the staff, commencing with three, is now about 130, including about 60 at the E.R.A. Laboratory.

Surge Phenomena

Mention should also be made of support given by the Central Electricity Board, which will shortly have contributed £42,000 spread over six years, to enable the Association to deal on an adequate scale with problems of immediate interest affecting the grid. In consequence of this support a comprehensive programme of research has been developed relating to every aspect of surge phenomena. Important work has been done of immense service to the industry which, apart from the far-reaching indirect benefit, should enable the Board in the near future to secure benefits showing a handsome return on the expenditure incurred through the Association.

This work on surge phenomena has covered the phenomena met with on the grid, the examination both in the laboratory and in the field of the numerous types of protective apparatus and methods already available, the effect of surges upon insulation and the development of new methods of protection. The Association has issued comprehensive reports on this work for the guidance of members, but the investigation of insulation and insulators also figures in the programme and involves pioneer work, much overdue, but in which good progress is now being made.

Insulation Research

Insulation problems figure very largely in the Association's activities. They are now fully occupying no fewer than 30 committees. This work falls into two categories. On the one hand there are investigations of the properties, classification, selection and application of known materials to known purposes. This work has always been given a practical turn by close association with the British Standards Institution, which has issued many purchasing specifications based on information furnished by the E.R.A. On the other hand there is the constant attempt to understand the nature of the complex properties of dielectrics commonly called fundamental research. This aspect is receiving continuous attention at the Laboratory and by special arrangement with the N.P.L., with occasional help from the universities. Many reports have been published in the Institution *Journal* and elsewhere.

When the E.R.A. was formed, insulating materials were purchased largely on price and appearance, supplemented by crude tests of electric strength which produced results of value only if employed with very large factors of safety. This was followed by a period of intensive study of dielectric loss phenomena and appreciation of the nature of thermal breakdown. To-day increasing attention is being given to the nature of the breakdowns process and also, on the practical side, to methods of anticipating breakdown, that is, examination of commercial insulation for indications of prospective breakdown.

Underground Cables

While the spectacular benefits derived by the electricity supply undertakings from the proper rating of buried cables did more than any other single piece of work to enlist the enthusiastic interest of that section of the industry, they served also to secure other important work on conductors which has been proceeding without intermission for twenty years and has revolutionised the data available to designers and users. This includes work on the design of poles and pole foundations as well as overhead lines, vibration phenomena, wind pressure on poles and lines, physical constants derived under field conditions, the direct and indirect results of heating and thermal expansion, losses in armouring and adjacent ironwork, and many incidental problems such as measurement of the thermal properties of the soil. Lately attention has been given to the mechanical and thermal effects of short-circuits, and to the rating of cables in buildings and in ships.

The problem of earthing in all its aspects has also been the subject of intensive study for several years and still requires a large amount of attention. Fortunately the Association

commenced a study of this subject about two years before any urgent demand for assistance arose in the industry, so that the ground had been prepared for rapid development. Earthing has been studied not only from the standpoint of safety and continuity of supply, but also in relation to interference with broadcasting and as a protective means in dealing with surge phenomena. The problem of earth resistance under impulse conditions is still receiving close attention and there are several unsolved problems relating to corrosion and to maintenance of good and economical earths.

Circuit-breaker Developments

Last century power arcs were quenched with dusters and later by immersion in oil, but the process of circuit rupture had not been properly studied and switchgear designers were not familiar with the physics of the arc. The development of efficient and reliable circuit-breakers to meet the requirements of to-day still presents unsolved problems, but much has been learned and very large sums are spent annually on research and development.

By common agreement the E.R.A. became the clearing house for information in this country and the principal instrument for fundamental research. This year's E.R.A. programme alone involves the expenditure of about £17,000 under this heading. Practically all the leading manufacturers of high-voltage switchgear are working under licence from the E.R.A., which was the first in the field with air-blast circuit-breakers of high-rupturing capacity and many other new ideas for circuit-breaker development.

The electrical industry covers a wide and diversified field overlapping many other industries. Many manufacturers of materials used in the industry find it profitable to co-operate through the E.R.A. and in this way important points of contact have been developed with, for example, the steel industry, and also with manufacturers of steam plant. As a result the Association has been able to organise, stimulate and finance researches of the greatest importance.

The work of the late Professor H. L. Callendar on the properties of steam was financed for a number of years by the E.R.A. which organised also the Interenational Steam Tables Conference and has continued the original researches under Professor A. Egerton and Mr. G. S. Callendar. It is expected that at the next Conference such a measure of agreement will be reached as will admit of the issue of agreed international standard tables of the properties of steam up to the highest temperatures and pressures in use.

Metals for High Temperatures

Allied with the researches on steam have been those on metals suitable for continuous use at the high temperatures envisaged, temperatures such as to give a dull red glow at least in a dark room. Research on the creep of metals at high temperatures was initiated under a committee of the D.S.I.R. on which the Services were represented as well as manufacturers and other experts. Researches relating to ferrous metals were transferred to industry and finally came under the wing of the E.R.A. These researches have undoubtedly contributed very materially to very large and increasing economies in the use of fuel in the production of electrical energy and it has also been shown that the annual increase in benefit enjoyed by the industry is alone comparable with the total income of the E.R.A. The total benefit accrued must now greatly exceed by many times the total expenditure of the E.R.A. on all its researches from the commencement.

Next to the G.P.O. the E.R.A. has taken the lead in solving the complex problems associated with interference in communication circuits, notably in broadcasting and television, and now possesses an equipment of measuring and recording apparatus developed at its own Laboratory second to none. It is giving continuous assistance to the manufacturing industry in rendering apparatus interference free. The work of the last few years must find its counterpart in increased sales of R.M.A. products in regions where their apparatus could not previously be used, and carries increased satisfaction to customers, who are ignorant of the work done behind the scenes.

The efficiency of fire fighting services in this country is such that it will come as a surprise to many to find how much could yet be done by research in securing the most effective use of available methods and apparatus, in coping with the various kinds of fires involving electrical plant and electrical risks. Through the full co-operation of suppliers of electricity, of manufacturers of fire fighting appliances and of the London Fire Brigade, rapid progress has been made recently and the industry will have shortly a number of definite recommendations covering the field indicated and including building design and construction and problems of ventilation.

In rural electrification and the applications of electricity to agriculture and horticulture, the industry is faced with a dilemma of a familiar type. If more electric power was used supplies would be cheapened. If supplies were cheapened more electric power would be used. How are these two benefits to be secured? Clearly by close co-operation between all the interests, leading to simplification of construction and procedure, standardisation, and the production of authoritative information for all concerned: information relating to the more efficient use of electricity and to the needs of the user. All these matters are now receiving close and continuous attention. The Association is already organised to act as a clearing house for all research and efforts in this field, and is engaged in planning and assisting new researches for the improvement of agriculture and agricultural amenities.

Voluntary Service

It is well known that all the above and many other researches are conducted under control of committees, a procedure which secures that very necessary liaison between the investigator and the industry which is responsible both for the high quality and the utility of what is done. The Association and the industry are greatly indebted to the many firms, undertakings and individuals who carry out the onerous voluntary duties of Committee members.

The original aim of the Council of the E.R.A. was to utilise to the full all existing organisations and research facilities without attempting to compete with them. The necessity for providing facilities where none was found to exist led to the development of research centres under direct control of the Association and finally to their merging with great advantage under one roof, in the very up-to-date E.R.A. Laboratory at Perivale. This Laboratory provides not only a headquarters for all the field work of the E.R.A. but, with saturation of other available facilities, the industry is looking more and more to the E.R.A. Laboratory to solve those problems which are beyond the scope or immediate interests of any individual manufacturer. The Laboratory was opened by H.R.H. the Duke of Kent in 1935, and already a second substantial extension is being planned.

The B.S.I. Luncheon

THE attendance at the annual luncheon of the British Standards Institution last week (on June 15th) was the largest of the series so far held. Owing to indisposition Sir Frank Heath (the retiring chairman) was unable to preside so Dr. E. F. Armstrong (past-chairman) deputised for him.

The toast of "The British Standards Institution" was proposed by the Right Hon. R. S. Hudson (Secretary, Department of Overseas Trade) who said no one could doubt that standardisation helped to reduce costs, to secure the availability of stocks and spare parts, and to foster co-operation between the manufacturers and their customers. They must concentrate more in future on inducing principals to make personal visits abroad, particularly the younger principals, also on getting more young foreigners to complete their education in this country. His Department considered that the B.S.I. was helping materially to facilitate export trade.

Dr. Armstrong mentioned in his reply that the year just completed had been the best on record from the point of view of support given to the Institution, which fact stimulated them in their endeavour to fulfil their mission. Many knotty problems had been solved during the past year. Their motto was to "go slowly" so as to avoid making obvious mistakes.

Sir Percy Ashley (chairman-elect of the B.S.I. and a member of the Import Duties Advisory Committee) proposed "Our Visitors," expressing gratitude for the ministerial help which was being rendered in connection with overseas trade, and mentioning especially efforts that were being made to establish an organisation in France similar to the B.S.I.

Lord Riverdale, replying on behalf of the guests, remarked that British standards were locked up with export trade, without which this country could not pay for the food and raw materials it imported. He said he believed that, given a revival of confidence, the world was on the verge of one of the biggest expansions of trade it had ever experienced.

Sir William Reavell (past chairman) proposed the health of the retiring chairman, expressing regret that Sir Frank had been prevented from attending that day's functions to crown the achievements of his year of office. His work had been of immense assistance and the "standard mark" to which Sir Frank had devoted himself for five years would be of great value.

Mr. C. le Maistre proposed a vote of thanks to Dr. Armstrong for presiding at short notice.

ELECTRICITY IN THE RHODESIAS

By Douglas Spencer

(Supplemented by information from an official source)

THE advocacy of the extended use of electricity in Southern Rhodesia has during the past year received two very great and distressing blows in the deaths of Captain the Hon. W. S. Senior, C.M.G., and Mr. R. W. Metelerkamp, A.M.I.E.E., both of whom lost their lives in the air—Captain Senior while flying alone to inspect a very valuable find of gold in one of his mines, and Mr. Metelerkamp while flying near Bulawayo to inspect some electrical developments.

In these two deaths the country lost, in the former the Minister of Mines and Public Works, who brought the Electricity Supply Commission of Southern Rhodesia into being; in the latter the fine practical electrical engineer who was the first chairman of the Electricity Commission. No two men could be so ill-spared in a growing country.

A short time before his death I was discussing with Mr. Metelerkamp electrical developments in general, and he laughingly referred to the abuse he was encountering for spending so much public money. At that time I think the figure was about £375,000. No doubt a very full justification indeed will be forthcoming in the figures for electrical imports into Southern Rhodesia in 1938.

Rising Electrical Imports

The comparative figures for the imports of electrical machinery for 1936 and 1937 are sufficient proof of the benefit of the Act to this country, to say nothing of its value to the industry in the Home Country. One has only to visit an electrified mine as I did recently, and compare it with the wood-fired boilers of a speedily developing mine two miles from my own house, but at the moment thirteen miles away from the last standards of a 23-mile line from the Gatooma station.

In the last few years there has been an enormous proportionate increase in the imports of everything purely electrical, while boilers, too, doubtless for electric power stations, have gone up in value. Decreasing imports of engines indicate an increase in the demand from the Commission's mains as against belt drive operation from steam and oil engines for stamps, pumps and mine supply in general. The value of electric motors imported rose from £14,241 in 1932 to £48,618 in 1937.

In an interesting article in the *South African Electrical Review and Engineer* the late Mr. Metelerkamp gave the cost of a 30-HP motor suitable for a five-stamp mill as £120, with its control gear. For some reason or other the cost of machinery in Southern Rhodesia is generally double its "value for home consumption" in Great Britain. This price is apparently fixed not so much by calculation as by condonation on the part of purchasers, owing to their not getting check prices from home, from firms who have not a "maximum profit clause" in their agreements with agents. I can only infer that, as a 1½-HP engine, advertised at £17 10s. delivered in England was offered me at £35 in this country, for small power purposes. It might be put forward as a recommendation that prices charged in this country should be checked up. This might stave off foreign competition which is bound to increase.

I cannot believe that, even backed up by the now perennial argument of "the heavy increase in prices due to the armament programme at home," the cost of a 30-HP motor and gear plus freight and rail charges comes to £4 per HP. It must be borne in mind that electrical plant from Great Britain is subject to no duty.

Representation in the Market

The time has surely come when the principal English electrical firms should establish their own offices, not only for the supply of plant, but also for the giving of advice. It is not often that a good salesman, with the right personality, who could give a customer sound technical advice would be "passed with an order."

Quite recently two new main plants have been purchased from Germany by barter, in exchange for a quantity of tobacco. It is true that that was before the incidents of last September. None the less the deal meant the immediate realisation of cash for a large amount of tobacco, which would otherwise have had to wait for the market.

The proportion of Southern Rhodesian requirements bought in Great Britain and British countries is a very high one. For the eleven months ended November 30th, 1938, it was £6,413,412 out of a total of £8,701,169. From the United Kingdom alone she imported a value of £4,252,480. If from her exports to the United Kingdom we deduct the value of the gold sent home we find that of general produce, including chrome ore and asbestos, the United Kingdom only purchases general produce to the value of £1,870,297, which shows an adverse balance of nearly 2½ millions against Southern Rhodesia.

It is hardly to be wondered at that the United States gets a large proportion of orders from Rhodesia, as it comes third in the list of importers of Rhodesian produce, other than gold. In 1937 it imported chrome ore to the value of £460,000 as against the £45,000 imported by the United Kingdom, whose imports of the ore were only just larger than those of Norway and France.

Markets for Raw Materials

One has to bear in mind that gold production has never yet settled a country, however much it may have assisted in opening it up, as witness Australia, New Zealand and Canada and the Union of South Africa. Perhaps the reason is that so little of the cash resulting from the sale of gold is spent in the country which produces it, unless gold production is well taxed.

It is necessary therefore for Rhodesia to look for other means of helping other industries parallel with gold mining, such as chrome ore and asbestos, in fact any industry in which labour is a greater proportion of the cost, so as to increase her internal markets. The United Kingdom might help with larger purchases of chrome ore and still more of tobacco. In the former direction electrical works can surely help.

But this trade balance question may be considered beside the mark, when one is writing of things electrical. An increase of £200,000 on the 1936 total of £252,000 certainly shows a healthy market. The 1938 totals which will shortly be available should reveal continued growth though not at so high a rate.

However much truth there may be to-day in the statement that Southern Rhodesia's prosperity is due to her gold mines there will prove to be other baskets in which eggs of commercial initiative and energy may be put. The development of new coal limits nearer to Bulawayo than Wankie is being watched with interest and should result in bringing down the price of coal for power and other purposes from its unduly high figure. The increasing demand for agricultural fertilisers not only for crops but for pastures may lead to important developments in electrical plant demands.

In at least half the country the rainfall is over 30 in. a year and the Government Survey Department is already surveying rivers. Its work will supply data not only for irrigation but also for power development, and further for assisting in the campaign against soil erosion. The problem of water conservation is naturally different from that in snow-fed catchment areas, but it is expected that irrigation-cum-power schemes will in time be carried out extensively, the former part bearing the greater proportion of the civil engineering costs.

"Reciprocity"

The purchase by barter of electrical machinery from Germany (a third instance was just avoided by temporary public feeling), the occasional approach to parity in exports to and imports from the United States of America are an indication of the closer watch being kept on reciprocity. More than a casual glance is being turned on shipping freights, when as much as 4s. per bag of maize has been paid to the shipping company as against the 6s. which the farmer gets for growing it. Again, the London merchants tell us that it will not pay us to grow soya beans, though of excellent quality, because cheaper freights from China cut us out.

Finally it must be remembered that the problems of Southern Rhodesia are very much the concern of those at home; our expansion in the production of ordinary commodities other than gold depends on the market provided at home. Without an increase in that market gold mining will be the only means of supporting an increase of population, and gold mining only gives direct employment to 2,400 whites. Rhodesia

cannot expect electrical workmen to browse on maize meal, but all can smoke Rhodesian tobacco and enjoy it; where chrome is wanted Rhodesian can be specified, and the same with regard to asbestos, while Smithfield can supply Rhodesian beef.

Mining and Import Trade

We are able to supplement the information given by Mr. Spencer with some notes received from an official source which deal with both Northern and Southern Rhodesia.

The two Rhodesias are fortunate in having within their boundaries abundant sources of energy. The world famous colliery at Wankie, which is reputed to have a life of 4,000 years at the present rate of production, supplies easily-won steam coal of excellent quality. Other vast deposits of coal are known to exist should they be required, but for the present Wankie coal fires the boilers of the railways in both Rhodesias and of generating plant in the copper belt, in the gold mining areas of Southern Rhodesia and in the towns of both territories.

Southern Rhodesia and Northern Rhodesia, of course, jointly possess in the Victoria Falls one of the world's most spectacular potential sources of energy. The Falls are unharnessed except for a plant installed on the Northern Rhodesian bank, which supplies power and light to the nearby town of Livingstone, but at one time it was proposed to utilise the Falls for supplying electricity to the gold mines of the Witwatersrand some 600 miles away; the scheme did not mature but no doubt the potentialities of the Falls could be exploited if necessary.

Power Plants at Mines

Mining operations in the two Rhodesias differ in many ways. In Northern Rhodesia there are four copper mines, three operating and one about to be reopened, and one mine producing zinc, lead and vanadium. All operate on a large scale and there are practically no smallworking mines. The generation of electricity by each mine for its own operations and the use of its employees is therefore found to be an economic proposition.

The copper mines have a long term contract with the Wankie Colliery for the supply of coal at a special price on condition that hydro-electric generation will not be undertaken but the zinc mines at Broken Hill own a hydro-electric power plant at Mulungushi where a dam impounds 800,000,000 cubic feet of water when full. At the power station three Pelton wheels are coupled to generators totalling 15,000 kVA at 2,200 V. This power is stepped up to 66,000 V and carried to Broken Hill over a forty-mile overhead transmission line. In times of drought the supply of water has unfortunately proved insufficient and mining output has been seriously reduced. A steam power plant is therefore being erected to supplement the power from Mulungushi.

Individual mining operations in Southern Rhodesia generally are on a small scale and are widespread in the country. Statistics for 1938 show that out of 1,569 producers of gold only eleven mines produced over 10,000 oz. each a year while the output of 1,431 producers was less than 1,000 oz. each a year.

These conditions of production favour centralised generation of electricity for sale to mines and in 1936 an Electricity Supply Commission was formed to undertake such supply without making either profit or loss. During its short history the Commission has acquired and enlarged existing municipal power stations at various centres and has erected and put into operation two further stations; a third station is in the course of erection. Many miles of high-voltage line have been constructed. This vigorous electrical development of Southern Rhodesia's principal mining areas was due mainly to the Hon. Mr. W. S. Senior and Mr. R. W. Metelerkamp.

British Equipment

At the well-known Roan Antelope copper mines there is a steam power plant comprising a 12,000-kW and two 7,000-kW turbo-alternators with a 365,000 lb. per hour boiler plant. The total electrical load is at present about 17,000 kW and some power is "exported" to Mufulira.

At the latter place there is a 30,000-kW power station with a 14,000-kW, two 7,000-kW and two 1,000-kW turbo-alternators. The two stations are connected by a 66-kV, 10,000-kW line about 50 miles in length. There are three sub-stations and remote-controlled 66-kV outdoor switchgear is installed.

The Nkara power plant of the Rhokana Corporation, Ltd., consists of three 10,000-kW and two 3,000-kW Metropolitan-Vickers turbo-generators fed by pulversed-fuel-burning International Combustion boilers. The overall efficiency on kWh sent out is stated to be 18.26 per cent. and the cost per kWh 0.27d.

At the same company's Nchanga station a 6,000-kW and a 3,000-kW Metropolitan-Vickers turbo-generators were installed last year, together with three International Combustion 40,000/45,000 lb. per hour boilers. A further 6,000-kW set is being added this year.

A large proportion of the power at these copper mines is employed for air compressors and blowers.

Development in the towns of Northern and Southern Rhodesia has also been rapid, particularly in recent years. As no town is yet fifty years old electricity has not had to compete with other than primitive forms of lighting and heating and great progress has been made. Bulawayo, for example, which in 1936 had a generating plant with a capacity of 625 kW will shortly have a plant with a capacity of 18,500 kW. Salisbury, the other large centre of Southern Rhodesia, which now has a municipal plnt with a capacity of 13,500 kW has also shown similarly rapid expansion.

Electrical Imports

The imports of electrical machinery and material during 1937 (the latest year for which statistics are available) are shown below compared with those for the two previous years. There was a substantial increase in 1937, due very largely to the additional demands of the newly constituted Electricity Supply Commission in Southern Rhodesia and of the copper mines in Northern Rhodesia. Imports were certainly on a yet larger scale last year; capital plant was probably responsible for increases of over 50 per cent. in both territories.

	1935	1936	1937	U.K. share 1937
Southern Rhodesia	£	£	£	%
Batteries	18,912	17,671	18,476	62.0 (U.S.A. 27.5)
Motors	39,083	31,247	48,618	86.5
Transformers	7,376	13,472	51,366	90.0
Other electrical machinery	69,234	65,098	128,672	85.0
Electric cable and wire ...	36,815	49,128	122,913	92.0
*Other electrical material ..	24,731	30,159	35,895	59.0 (Canada 14.2)
Electric lamps	15,900	14,043	16,552	87.5
Northern Rhodesia				
Batteries	6,125	4,668	11,587	39.0 (U.S.A. 57.5)
*Other electrical machinery and material	199,062	81,762	235,892	72.0
Electric lamps	5,718	2,837	8,046	95.0

* This item includes, *inter alia*, all domestic electrical appliances.

Trade in electrical machinery and material is mainly conducted through agents resident in the area. A few manufacturers have subsidiary local companies for selling their products but the majority of manufacturers operating in the market are represented by local engineering firms in Salisbury or Bulawayo, or both towns. Some have branches in N'Dola, the centre for the Northern Rhodesian copper belt. Many of the Rhodesian concerns are branches or subsidiaries of similar firms operating in the Union of South Africa.

The copper mines of Northern Rhodesia place most of their business direct with the overseas manufacturers or call for tenders in Johannesburg but otherwise municipal and mining business is generally placed locally and to secure a share it is essential to be represented in the territories. Stoves, refrigerators and other domestic appliances are handled by some engineering firms but also by music, hardware, sports and other dealers.

Preferential Tariffs

Electrical machinery and material of British manufacture enjoy a measure of customs duty preference over goods of foreign manufacture in both territories. Generating machinery, transmitting and storage material, excluding batteries, of United Kingdom or other British Empire manufacture are admitted free of customs duty into both Colonies, imports from foreign countries being dutiable at 10 per cent. *ad valorem*. Electric lifts, industrial and mining machinery also are admitted free of duty, similar importations from foreign countries being dutiable at 5 per cent. Electric heating and cooking appliances of United Kingdom or Empire manufacture are duty free upon importation into Southern Rhodesia but pay 10 per cent. upon importation into Northern Rhodesia; similar goods of foreign manufacture are dutiable in the two colonies at rates of 15 and 20 per cent. *ad valorem* respectively.

Apart from these specific preferences given to British goods under the Customs Tariff Acts of the two countries there is a strong sentiment amongst buying authorities favouring the purchase of British goods where feasible: the principal municipal authorities give preference to goods of United Kingdom manufacture and during recent months valuable contracts have been awarded to United Kingdom firms in the face of strong price competition from foreign firms.

With regard to the future, further expansion of the use of electricity and electrical machinery and apparatus is chiefly dependent upon the continued development of the mineral resources of the country and at the present there appears to be no reason why this should be checked.

PIN-TYPE ANGLE POLES

By J. Bailey, A.M.I.E.E.

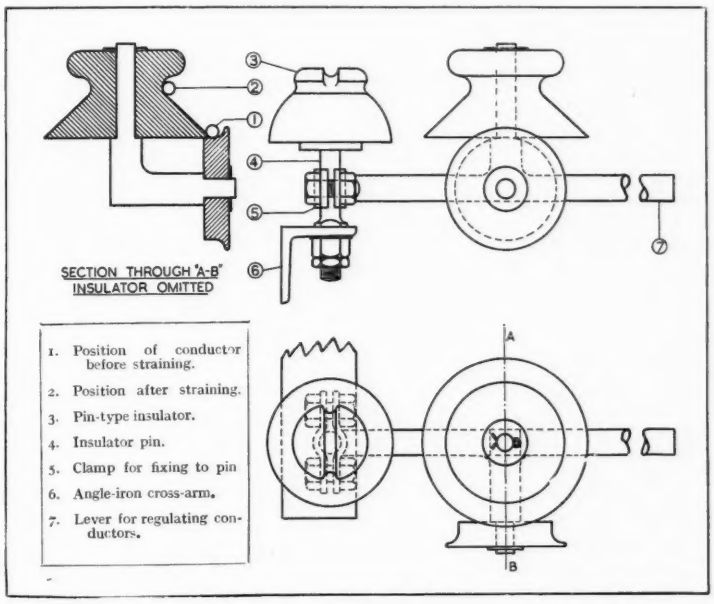
A Simple Design for Line Deviations

IN the erection of high-voltage transmission lines the use of pin-type angle poles for other than small line deviations has both advantages and drawbacks. I have endeavoured to overcome the difficulties inherent in the design and, as a result, methods of erection have been devised which show a considerable saving over the alternative type of structure.

The alternative method of dealing with line deviations is to treat the pole as a section pole, using strain insulators. The cost of this design is considerably greater than that of using pin type insulators, both initially and in erection, since an additional straining point is introduced.

As an example, the cost of an angle pole, 40 ft. long with a diameter of 12 in. at 5 ft. from the butt and fitted with double cross arm and ridge iron, complete with duplicate pin-type insulators, earth wire, number plate, climbing guard, danger notice, earth wire guard and earth plate, is £10 2s. The same pole fitted with strain-type insulators and jumper pins would cost £12 5s.—about 21 per cent. more.

The two chief objections to pin-type angle poles are the difficulty in regulating the conductors in regard to position while straining the line and binding in and the difficulty of changing faulty insulators, particularly with the high line tensions experienced with stranded-steel conductors. These difficulties may both be overcome by employing some form of regulating device for the conductors, which will hold the conductors in their final "bound in" position for sagging purposes, and will also move the conductors clear of the insulators and hold them in this position while the line is served with soft copper tape or the insulator changed.



Regulating device for overhead lines at pin-type angle poles

Many different types of device were tried but most of them suffered from the defects of over-complication and difficulties in fitting and adjustment. An unsatisfactory device of this kind which requires constant attention during progress of the work soon negatives any saving. It was finally decided that the device should be light and portable, should be capable of being fitted to all conductors on a pole by one man within 15 minutes and require no further adjustment.

The design illustrated has been found to fulfil all the above requirements. It consists of a lever arm, at the end of which is a clamp for fixing round the insulator pin, between pin and cross-arm. Two grooved rollers are provided, set at right-angles, one being perpendicular and the other horizontal. When stringing the lines, the conductors are placed in the grooves of the horizontal rollers, which take the place of snatch-blocks at angle poles. As tension is applied, the conductor automatically transfers itself to the groove in the vertical roller which is set to be in line with the side groove of the insulator. The fitting is clamped in such a position that the conductor actually runs in the insulator groove, just clear of the surface of the porcelain.

Placing the Conductor

The line may then be adjusted to its correct sag with the certain knowledge that this will not be altered in any way when finally bound to the insulators. Having clamped the conductors at the straining end, the clamping nuts on the regulating device are slackened sufficiently to permit the fitting to be rotated about the pin. The conductor is then levered clear of the pin into such a position that the resultant tension in the conductor is in line with the lever arm. A very slight turn on the clamping nuts will maintain it stable in this position whilst the conductor is served with soft copper tape. The conductor is allowed to fall into the side groove of the insulator and is bound in and the device removed.

The fitting is equally useful for changing broken insulators, it being only necessary to lever the line away from the faulty porcelain in order to give complete freedom to the linesman. The total length of the fitting described is about 18 in., as in this size it is convenient to fit to the pins. When straining a 0.1 sq. in. conductor with 400 ft. span at a 30 deg. deviation point, the linesman would have to exert a force of about 336 lb. at the end of the lever to force the conductor away from the insulator. For this purpose, therefore, an extension lever is slipped on the lever proper, and the length adjusted to suit. For small deviations, however, this extension lever is not necessary.

Insulator pins are supplied with elastic limits of 1,000 lb. and 2,000 lb., and the latter are employed for all but very slight deviations, either singly or in duplicate, depending upon the deviation. If fitted in duplicate, a double cross-arm is also required.

The maximum permissible angle of deviation for any conductor may be calculated from the following: If P = maximum permissible force, in lb. on insulator; W = tension in lb. in conductor under worst load conditions; L = span in ft., assuming equal span on each side of pole; D = overall diameter of conductor with ice loading, in inches; θ = maximum permissible angle of deviation.

$$\text{Sin}\,\frac{\theta}{2} = \frac{W - \sqrt{W^2 - 0.66LD(P - 0.66LD)}}{0.66LD}$$

If elastic limit of pin is k lb. and factor of safety is F, $P = k/F$ lb.

The accompanying tables give maximum permissible angles for a few copper and steel conductors, with different arrangements of insulator pins. These tables are based on 400 ft. spans for the copper conductors and 500 ft. spans for the steel conductors. Worst load conditions assume a wind of 60 m.p.h. (8 lb. per sq. ft. of projected area) blowing in a direction taken up by the resultant force on the insulator pin, and ice loading of ⅜ in. radial thickness at 22 deg. F.

TABLE I.—WITH ONE 2,000-LB. PIN.

Size of conductor	Material	Overall dia. with ice	Maximum deviation	
			F—2	F—2.5.
in.		in.	deg.	deg.
7/.104	Copper	1.062	25	17
3/.180	Copper	1.138	19	14.5
7/.136	Copper	1.158	17	11.5
7/.080	Steel	0.99	25	17
7/.104	Steel	1.062	13.5	8.5

TABLE II.—WITH TWO 2,000-LB. PINS.

Size of conductor	Material	Overall dia. with ice	Maximum deviation.	
			F—2	F—2.5
in.		in.	deg.	deg.
7/.104	Copper	1.062	61	45
3/.180	Copper	1.138	49	37
7/.136	Copper	1.158	36.5	29
7/.080	Steel	0.99	68	49
7/.104	Steel	1.062	36.2	25.5

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

I.M.E.A. Distribution Proposals

I WAS greatly surprised on looking through the technical press for the current week to find that little or no comment had been made on the vitally important subject of the I.M.E.A. distribution proposals for the reorganisation of electricity distribution, in spite of the fact that it occupied no fewer than four pages of the annual report presented at Harrogate last week. It is quite evident that the importance attached to these proposals by all sections of the municipal side of the supply industry has not been fully appreciated, which is probably accounted for by the fact that the proposals were carried unanimously at the annual meeting without discussion, whereas many people apparently anticipated that the smaller undertakings would have something to say on a matter of such importance. It may perhaps be well, therefore, that I should state as briefly as possible how these proposals originated.

The smaller undertakings have for some considerable time past been of the opinion that some definite proposals of a constructive character should be put forward by the industry itself, to carry out many of the suggestions contained in the McGowan Report without resorting to the objectionable and unjust methods advocated in the "White Paper." As a result the representatives of the smaller undertakings on the Council of the I.M.E.A. pressed very strongly for a special sub-committee to be set up for this purpose on which all sections of the Council should be represented, and this was eventually agreed to. The sub-committee appointed met on a number of occasions and finally reached agreement and issued a report, which with minor amendments was *unanimously accepted* by the Council and also by the members attending the annual meeting at Harrogate. This result, it will, I think, be generally agreed, was no mean achievement bearing in mind the differences which existed at Brighton and Torquay.

In view of the above I do suggest that these proposals are worthy of the most serious consideration, particularly as I know that they have also received a considerable measure of approval and support from important sections of the company side of the industry.

It is surely better to have a Bill introduced embodying agreed proposals from within the industry itself, rather than one imposed on the industry from without, which if it bears any resemblance to the objectionable "White Paper" proposals, will cause another upheaval within the industry and be met by the most uncompromising opposition and fought clause by clause at every stage during its passage through Parliament, which cannot help but seriously retard development.

As so little was heard of the smaller undertakings, as such, at the recent Convention, it appears to be thought in some quarters that this organisation is now dormant. May I assure you that very much the reverse is the case as a large and enthusiastic meeting was held in Harrogate on the evening of June 7th at which the present position regarding the reorganisation of distribution was fully discussed and arrangements made for presenting a united front and dealing with any eventuality affecting our interests which may arise in the future.

I desire on behalf of the smaller undertakings to express my appreciation of the cordial spirit of co-operation and goodwill which now prevails amongst all sections of the I.M.E.A. and particularly on the Council, without which, agreement on the proposals put forward—which, I suggest, might with advantage to the industry, be printed in full in the pages of the ELECTRICAL REVIEW—could not possibly have been reached.

ALFRED J. C. DE RENZI,
Honorary Secretary, Committee of Smaller Municipal Electricity Supply Undertakings.

Newcastle, Staffs,
June 19th.

Explanation Wanted

I thank Mr. Young of Hove and Mr. Lavis of Exeter for their interest in my query. I note, however, that both have assumed that the earthing was at fault, whereas it was proved by test, carried out by two separate engineers *after the fire*, that the conduit was efficiently earthed and conformed to I.E.E. Rules.

The supply into the premises is obtained from the town mains and consists of two separate services installed in separate parts of the building, the supply being 220 V DC. On one service the conduit is bonded to a main water supply and on the other the conduit is bonded to the lead sheathing of the supply company's armoured cable.

Had the earthing been by means of a metal plate, I quite realise the possibility of this proving faulty from several causes. Incidentally, the supply company generally wishes the bonding to be connected to its armoured cable.

Should there be any other matter that is not quite clear, I shall be pleased to give further information. PUZZLED.

June 19th.

Radio Set Resistances

For the third time in five weeks I have been called in to attend to fire damage caused by American "midget" AC-DC radio receivers. These sets are made for use on a 110-V supply, and their use on a 200-250-V supply necessitates a resistance to reduce the mains voltage.

Until recently many of them were equipped with a two-core resistor cord, wired in series with the heaters of the valves, the idea being that as the resulting heat was dissipated along a relatively long cord, it was safer than utilising a small wire-wound resistance inside the cabinet. This arrangement has now been discarded by American manufacturers in favour of compact "resistor tubes," resembling receiving valves, mounted on the chassis.

The danger arises when a short-circuit takes place at the low potential end of the resistor cord. The resistance wire is wound on a few strands of asbestos, and is enclosed by a thin layer of the same material wound spirally over it. This resistance element is enveloped in the same outer covering as the other stranded flexible conductor, and where it passes through the (usually) unbushed hole in the metal chassis, the rubber insulation often becomes defective, and the two conductors come into contact. As the resistance is fairly high, even a light fuse will not blow as a result of the fault, but instead the resistance wire becomes red-hot, and remains in this state for a considerable time—until the two conductors touch near the wall socket outlet. I have seen many scorched and burnt carpets from this cause, and two more or less serious fires.

The prevalent custom of fixing switch sockets in the most inaccessible position on the skirting, usually under the table supporting the wireless set, provides a big temptation to the user to turn off the set with the small switch on the receiver. He or she can hardly be expected to grovel on the floor to switch off the radio, and in most cases the cord is left alive.

The remedy is quite simple. If the switch terminals on the set are short-circuited, and a switch socket is fixed on the wall beside the set, it cannot be left in an unsafe condition. Portable electric fires are now fitted with a "live" bar, controllable only from the switch socket, and it is even more important to ensure that these makeshift resistor cords are not left alive. JOHN BLAND.

Edgware, *June 13th.*

Installation Inspectors

In view of the increasing numbers of supply authorities employing installation inspectors, it appears that the time is ripe for a classification of this section of the industry. Too many undertakings rely on sending an unskilled man out with a "Megger" with instructions to see that Home Office type switches are installed where there are stone or concrete floors, in bathrooms, &c.

Nothing galls a zealous and skilled contractor or his workmen more than to see this method employed by the undertaking, and I heard recently of a case where a contractor had completed a small lighting installation in c.t.s. cable, complete with all Home Office fittings, to discover that when the undertaking's employee called to test and inspect the job, he demanded an earth wire on the c.t.s.! A personal visit to the supply undertaking's offices was necessary before the job was passed.

On the other hand, many municipalities and supply companies go to the other extreme, and employ on this type of work college graduates, articled pupils, &c., who are probably brilliant theoretical technicians, but whose practical knowledge is nil.

It seems, therefore, that a combination of the practical and theoretical qualities go to make the best inspectors, and the

average contractor and workman respect and are willing to co-operate with the man who has had practical experience and combines it with a fair amount of theory. Personally, I am of the opinion that an exceptionally high technical standard is unnecessary, for surely a knowledge of, say, harmonic analysis, rotary convertor theory, &c., is not essential to the installation inspector.

I would suggest, therefore, that an installation inspector's certificate should be issued by the City and Guilds or any other responsible body, the examination consisting of a technical paper, of, say, National Certificate standard, combined with a practical test comprising, for example, an armoured cable joint, the setting out of an imaginary section of a new building in screwed conduit, the supposed building to be of concrete and all inspection places to be accessible, and the assembling of a small motor.

June 14th. CRAFTSMAN.

Cost of Electricity in Bombay

I attach a copy of my electricity bill for May (for my bungalow). I hope this may interest you. Comment is superfluous. G. BARNES.

Bombay, *June 12th.*

[The bill is as follows:—

(A). General purposes, *i.e.*, lights and fans 100 units at 2 annas	=200
(B). Power purposes, *i.e.*, refrigerator, cooking, &c. 80 units at ¾ anna	= 60
(C). Government electricity duty at 1¼ annas on (A)	=125
	385 as.

Note.—(C) is 62½ per cent on (A) and 48 per cent. on (A)+(B). One anna=1½d. approx.—EDS. ELEC. REV.]

Electrical Management

I thank "M.I.E.E." for his courteous and constructive criticism of my article in your issue of June 16th. I must say, however, that I did not imply that technical knowledge was unnecessary in management, in fact I stated "consequently we have commercial men highly trained and experienced in every branch of the business side and also by mature experience with the necessary technical knowledge."

No commercial men of experience would say that the distribution of electricity requires little technical knowledge, and I would be the first to admit that highly technical knowledge is required in the distribution side of electricity. Technical knowledge is essential in any industry, but the sale of the goods is another matter.

With regard to my own case, I can hardly be termed a non-technical man. I have assisted various chiefs in highly technical matters. My whole point is that the commercial man as a rule takes a secondary place to the technical man, although many of the so-called technical men have not had proper technical training, and again I emphasise that the commercial man must organise, otherwise he will be overlooked by the technical man who admits the importance of the commercial side but has also aspirations to commercial knowledge and control.

"M.I.E.E." says that I do not define the term, and that one may take it to apply to men who have been trained in the office and have not had a technical training. I think my article distinctly refers to the men who have both commercial and technical knowledge, particularly the commercial man.

With regard to the assertion that a non-technical man probably does not know the meaning of power factor all I can say is that if he is so lax as not to keep abreast of such matters, either in the commercial or technical directions, then he is definitely of no use to the industry. But how many so-called technical men could give a lucid account of power factor, load factor, diversity factor and other matters which affect revenue-earning capacity? J. C. PETERSEN.

South Shields, *June 16th.*

An Indian Accident

I append herewith details I have received from a friend of mine regarding an accident at Secunderabad, India. The circumstances are peculiar, and so far no decisive explanation has been arrived at. I should be glad if you would kindly publish this extract, so that the opinions of your readers may be obtained:—

"A. was sailing on the Husai Sagar Lake, Secunderabad, with R. when a storm and a high wind arose. Their boat came up against an electric pylon and the mast came into contact with the overhead electric cable. It seems that A. was holding the sheet rope round his hand when this happened. They both jumped out of the boat and R. was able to jump well clear of it, but A. could not. When the mast came into contact with both wires they fused and sheared, and one of them must have touched A. on the arm near the elbow where there was a reddish-brown mark. R. was getting terrific shocks in the water and naturally could not do anything to help A.

"The shocks were naturally much more severe close to the boat and A. must have been so stunned that he could not save himself, as when rescued he was found to be dead. The electric shocks were so strong that when R. was in the water sometimes he was flung forward on his face and the next moment was thrown flat on his back. It was amazing that he escaped at all. There is another cable about 3 ft. under the surface of the water, but whether it contributed to the accident I cannot say.

"There were many more people sailing that morning, but they had no difficulty in coping with the disturbed conditions in the lake. The accident must have happened about 11.45 a.m. It was so dark that I had to turn on the lights, but they went out shortly afterwards."

June 15th. R. M. F.

Civil Engineers' Conversazione

MOST of the electrical items in the exhibits displayed on the occasion of the annual conversazione of the Institution of Civil Engineers last week (June 14th) had been on view elsewhere recently. One of several lectures delivered during the evening was by Major B. Binyon on the subject of accelerated motion photography in colours.

A magnetic thickness gauge demonstrated by Mr. B. E. Martin (Radiation, Ltd.) has been developed primarily for measuring the thickness of vitreous enamel coatings on cast iron, such as a domestic cooker, but can be used to measure any non-magnetic base. A search coil is placed on the surface to be gauged and connected to a similar, but adjustable, coil within the instrument which, in effect, is an electrical balancing bridge providing a direct reading. It is inexpensive and of small dimensions, being energised by a small dry battery.

The War Office demonstrated how rapid anti-aircraft gun fire is directed with the aid of a predictor (Vickers Armstrongs, Ltd.) which telescopically keeps the target in sight, thereby automatically developing the necessary data in terms of bearing, elevation and fuse setting, which are transmitted electrically to receivers at the guns by a special self-aligning AC method through a trailing cable. When both pointers of a receiver coincide the gun is set to the indicated position, the operation being continuous, and one predictor may serve two or four guns.

Asbestos materials for sound and heat insulation were shown by Newalls Insulation Co., in addition to a sound-recording instrument and particulars of a noise-trap ventilator admitting air without noise.

A model of a power station by Mr. A. G. Bugden (Stewarts and Lloyds, Ltd.) illustrated a typical layout of high-pressure steam pipes with corrugations for flexibility and welded joints of the Dawson type.

The G.P.O. exhibited photo-electric scanning equipment for selecting and stacking letters according to the position of the stamp. A means of minimising stray cable currents by cutting a small gap in the lead sheath and covering it with a rubber muff held in place by metal casing was displayed. There were also a wide-band co-axial cable repeater, cable anti-creepage devices and a non-plumbed cable joint (using rubber end-pieces and clips) for gassy positions.

Dr. C. C. Paterson's electron "pencil" consisted of a G.E.C. cathode-ray tube the deflecting plates of which were energised by means of photo-electric cells excited by light-beams interrupted by a revolving cam. By changing the profile of the latter any desired pattern or lettering can be produced on the fluorescent screen.

Apart from a B.T.H. "telebrightness" meter for street surfaces, and a method of studying lamp vibration under stroboscopic light, Mr. F. H. Clough showed how flow of current can be controlled by illuminating a selenium photo-voltaic cell. The output of the latter is passed through an auxiliary winding around one leg of the core of a saturable reactor, through whose main windings the contactor coil is fed from the mains. The change in impedance of the main coils, caused by the passage of current in the auxiliary coil, controls a contactor which starts and stops an electric motor.

Other items were light sensitive switches by Venner Time Switches, Ltd., a "Multilec" temperature recorder-controller by George Kent, Ltd., and an electrically-recording accelerometer (cathode-ray type) developed by the N.P.L. in connection with the measurement of wheel impact forces on road vehicles. Sir Robert A. Hadfield's metallurgical exhibits included specimens of welded heat- and corrosion-resisting steels and a "quick immersion" thermo-electric pyrometer of N.P.L. design for measuring the temperature of liquid steel.

D

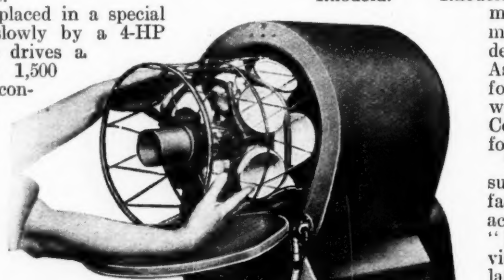
NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Domestic Washing-up Machine

A NEW "Dreadnought" washing-up machine has been brought out by ELECTRICAL AIDS (DREADNOUGHT), LTD., 32, Sackville Street, London, W.1.

The articles to be washed are placed in a special cage and are made to rotate slowly by a 4-HP Hoover motor. The motor also drives a three-bladed impeller at about 1,500 RPM, directing the water with considerable force on to the crockery as it revolves. This is allowed to continue for about half a minute, when the impeller is stopped by a clutch at the rear of the machine, and the contents are thoroughly sprayed by a perforated tube at the top of the cabinet. The tube is connected directly to the hot-water system in the kitchen.



"Dreadnought" washing-up machine

For cleansing the dishes a temperature as low as 90 deg. F is sufficient owing to the high velocity of the water on impact with the plates, but a higher temperature is essential for quick drying, and a 750-W G.E.C. automatic safety immersion heater can be fitted to act as a booster when the temperature of the normal hot water supply from the domestic boiler does not suffice.

Two cages are provided, one for cups and one for plates, enabling the second one to be filled while the first one is being washed. An unusual and useful feature of the machine is the extended shaft fitted to the motor, so that by disconnecting the impeller drive by means of the clutch the motor can be used, through a flexible shaft, for such work as grinding, polishing and mixing.

The casing, which is of welded cast aluminium throughout, is of pleasing design and cream enamelled, while the size of the machine is such that it can be stood on the draining board or in the average sink.

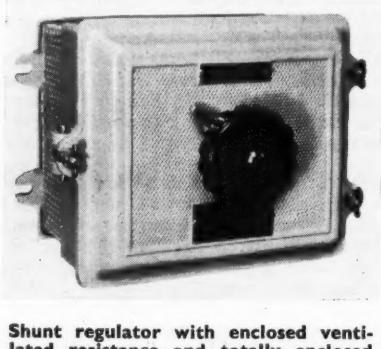
Mobile Pumps

Mobile pumps originally introduced for small scale vacuum and pressure work are now available from W. EDWARDS & Co., Allendale Works, Southwell Road, Loughboro' Junction, London, S.E.5, for laboratory technicians who may require their services occasionally, or when it is not desired to take up space permanently with a bench type. The outfits can be wheeled out of the way when finished with and, being self-contained, are always ready for work. Standard stock types can be altered to suit special requirements.

Shunt Regulators

Faceplate pattern shunt regulators for motors, generators and alternators are the latest products of the POWER EQUIPMENT CO., LTD., Kingsbury Works, Kingsbury Road, London, N.W.9.

They are rated for continuous duty and comply with B.S.S. 280/1928. The design is pre-eminently for use as shunt regulators, but the units can be supplied in a wide range of ohmic values with current-carrying capacities of 20 A for use as variable rheostats and potentiometers.



Shunt regulator with enclosed ventilated resistance and totally enclosed cover over faceplate

Five types are made. Three are for front of board mounting, enclosed ventilated models with open faceplate, a slotted cover over the faceplate or a totally enclosed cover over the faceplate. For back of the board mounting, also of the enclosed ventilated type, are open faceplate models with an extended spindle fitted with a handwheel and indicator plate and a totally enclosed faceplate. In general construction the regulators follow closely the design of the standard DC motor starters which were described recently. Wattage ratings obtainable are 150, 250, 350, 500, 900 and 1,500.

Fluorescent Mouldings

One of the more recent developments of MAY & BAKER, LTD., 42 and 43, St. Paul's Churchyard, London, E.C.4, is fluorescent "Rhodoid." "Rhodoid" is a light resilient and easily manipulated cellulose acetate sheet material from which shaped articles and decorative panels can easily be produced. As it is available in a non-inflammable form known as "Sceneroid" it conforms with the regulations of the London County Council in respect of materials for use on the stage.

The fluorescent powder is not on the surface but is incorporated during manufacture, so that there is no danger of the active material rubbing off. Fluorescent "Rhodoid" shows strong colours in both visible and ultra-violet light, but in the latter the colours are, of course, different.

There are five basic colours: rose, green, orange, blue and violet; others have been developed by welding together thin sheets of two or more basic colours.

Flexible Couplings

A new design of Renold flexible coupling has been introduced to meet the need created by the wide use of small-power, high-speed machinery which is invariably coupled to a fractional-horse-power electric motor.

It consists of three working parts—two metal bodies with intersecting jaws separated by a resilient rubber spider. Axial and angular displacement of the shafts connected is permitted by this coupling which also provides protection from the effects of impulsive loads and vibration. No protection is needed from wet or oily conditions and no lubrication, adjustment or attention is necessary.

The coupling is fixed to the shafts by a screw which is incorporated in, and flush with, each half body. Suitable applications include electrically driven office equipment, small refrigerator compressors, washing machines, sewing machines, motor-dynamo and motor-pump sets, small tools and shop appliances and fans.

There are three sizes, the smallest covering horse-powers up to 1 at 10,000 RPM, the medium size up to 3.25 HP at 6,500 RPM, and the largest up to 9.6 HP at 4,800 RPM. They are ready bored for standard motor shaft sizes and can of course be rebored to suit special shafts.

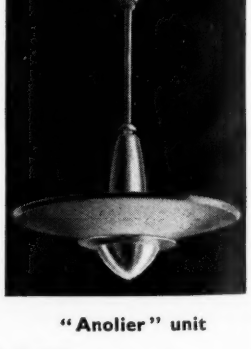
These couplings are made by the RENOLD & COVENTRY CHAIN CO., LTD., Didsbury, Manchester, 20.

Indirect Lighting Units

BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, London, N.17, have recently introduced two reflectors under the name of "Anolier" which are designed to combine high lighting efficiency with pleasing appearance.

These fittings will accommodate lamps rated at from 200 W up to 1,000 W. The light is spread at a wide angle over the ceiling, allowing a spacing of five to one for even illumination. As most of the light control is effected by the lower cup, which is easily removable, cleaning and lamp renewal can be carried out without climbing above the fitting.

A simple arrangement enables a small proportion of the light to illuminate the lower side of the main reflector so providing a light appearance to the unit. The fittings are aluminium with anodised finish.



"Anolier" unit

Dart-board Lamp

BROWN BROTHERS, LTD., Browns Buildings, Great Eastern Street, London, E.C.2, have produced the "Double Top" dart-board lamp which is made on the bent-arm principle and is designed to be clipped over a picture rail or screwed to the wall. The lampholder takes an ordinary bayonet cap lamp, which is concealed behind a polished reflector. Thus the light is shielded from the player's eyes while throwing the maximum illumination on to the board.

The lamp is supplied in enamelled finish and is complete with flex, lampholder and b.c. adaptor.

OVERSEAS ELECTRICAL TRADE

Reduction in Electrical Machinery Exports

THROUGHOUT last year and in the early part of the current year the expansion in electrical exports contrasted strikingly with the general weakening of the country's overseas trade. This was brought about by the large quantities of electrical machinery exported. In March there were signs that the peak had been reached, and in April the value of machinery exports dropped well below that for the corresponding month of 1938. The Board of Trade returns for May published last week reveal a further contraction from April's total of £515,351 to £488,869. It is pleasing to notice, however, that exports of electrical goods and apparatus, which have not been very satisfactory recently, showed a slight recovery on a year ago and were appreciably better than in April (£1,106,696 compared with £922,705). Altogether, during May exports amounted to £1,595,565, compared with £1,438,056 in April and £1,729,858 in May, 1938.

TABLE I.—EXPORTS AND IMPORTS DURING MAY

	Exports			Imports		
	May, 1939	Inc. or dec. compared with May, 1938		May, 1939	Inc. or dec. compared with May, 1938	
Submarine telegraph and telephone cables	£18,512	+	£524	*		—
Telegraph and telephone wires and cables (not submarine)	71,611	−	27,838	*		—
Other insulated wires and cables	302,111	+	50,983	£24,111	−	£6,021
Radio receivers, not radiograms (excluding valves)	36,311	+	14,357	19,534	+	9,685
Radio transmitters (excluding valves)	22,871	−	5,538	*		—
Radio valves	29,458	−	4,313	15,557	+	8,274
Other radio parts and accessories	36,343	+	1,523	69,453	+	24,387
Telegraph and telephone apparatus (other than radio)	212,089	−	41,486	*		—
Electric carbons	*		—	7,207	−	105
Incandescent lamps	55,035	+	9,847	8,991	−	2,726
Other lighting apparatus	53,363	−	1,405	31,724	−	5,415
Primary batteries	14,705	+	1,189	*		—
Accumulators	21,662	−	13,783‡	*		—
Electric cooking and heating apparatus	27,882	−	2,831	*		—
House service meters	23,701	−	890	*		—
Other electrical instruments (not telegraph or telephone)	26,502	+	2,014	28,253	−	4,644
Insulating materials not elsewhere specified	19,435	+	481	*		—
Unclassified electrical goods and apparatus	135,105	+	23,969	74,894	+	15,679
Electric generators up to 200 kW	29,061	−	2,541	*		—
Electric generators over 200 kW	81,057	−	5,821	*		—
Electric motors	110,521	−	36,581	25,431†	−	1,347
Converting machinery	600	−	45,255	*		—
Transformers for lighting, heating and power, including coils	67,915			*		—
Rectifiers for power-house use	2,779	−	501	*		—
Starting and controlling gear for motors	41,407	−	5,224	*		—
Switchgear and switchboards (not telegraph or telephone)	120,272	−	33,436	*		—
Other electrical machinery	9,337	−	4,271	12,487	+	629
Electric vacuum cleaners	25,920	−	9,246	15,542	−	6,697
Total	£1,595,565	−	£134,293	£333,184	+	£31,699

* Not classified separately. † Not railway and tramway motors.
‡ Values not completely comparable.

Largely concerned in the better showing of goods and apparatus exports was the increase in shipments of insulated wires and cables (other than telegraphic and telephonic)—the first for many months. The value for May was £302,111 compared with £209,002 in April, and was higher than in any month since the spring of last year. Australia was the principal market and, with British India, was responsible for a large part of the improvement, as the following analysis shows (May, 1938, values in parentheses):—

Rubber insulated wires and cables.—Australia £34,501 (£31,606); South Africa, £19,872 (£19,397); British India, £18,284 (£12,555); New Zealand, £10,321 (£6,219); other British countries, £26,148 (£23,039); and foreign countries, £13,891 (£16,374). Total, £123,017 (£109,190).

Electric wires and cables, insulation other than rubber.—Australia, £45,508 (£30,458); South Africa, £42,830 (£46,447); British India, £33,536 (£16,576); other British countries, £41,837 (£24,781); and foreign countries, £15,383 (£23,676). Total, £179,094 (£141,938).

In radio apparatus there was a substantial gain in exports of receivers, which numbered 7,667 compared with 3,577 a year ago, raising the total for the first five months of the year to 31,220 (against 25,280). Exports of valves and accessories declined, but the net result was to the good. Another section showing an improvement was lighting apparatus, with 2,220,000 lamps exported compared with 1,349,000 in May, 1938, while exports of unclassified electrical goods, at £135,105, reached the highest value since March last year.

On the other hand, telegraph and telephone apparatus, which, like machinery exports, had shown a consistent expansion up to April, decreased by £41,486. The following is an analysis of the chief markets, with comparative values for last month and May, 1938:—

Australia, £59,006 (£75,549); South Africa, £48,678 (£36,192); other British countries, £39,181 (£60,040); Argentina, £18,594 (£26,836); and other foreign countries, £46,630 (£54,958).

All types of electrical machinery were exported to a smaller extent than a year ago, with converting and transforming plant, motors and switchgear showing the greatest reductions. Under "other electrical machinery" much of the decrease was accounted for by the £71,791 drop in shipments to South Africa.

Last year electrical imports were lower in value than in either 1936 or 1937 and continued to decline in the first quarter of the present year. In April there was a small increase (£922) and last month the total of £333,184 was £31,699 in excess of the May, 1938, amount. This was largely due to increased radio imports, 9,872 sets and 126,685 valves being brought into the country as compared with 3,112 and 57,632 a year ago.

The United States increased its lead as the principal supplier of goods and apparatus and the Netherlands drew up on Germany, as shown in the following analysis:—United States, £92,477 (£68,836); Germany, £57,413 (£59,955); Netherlands, £51,525 (£29,827); Belgium, £16,642 (£20,435); Switzerland, £15,966 (£15,236); France, £14,984 (£10,484); other foreign countries, £18,650 (£21,620); and British countries, £12,067 (£14,217). Total, £279,724 (£240,610).

TABLE II.—BRITISH ELECTRICAL EXPORTS DURING MAY

Destination	Goods and apparatus, May, 1939	Inc. or dec. compared with May, 1938	Electric generators, May, 1939	Inc. or dec. compared with May, 1938	Electric motors, May, 1939	Inc. or dec. compared with May, 1938	Other electrical machinery, May, 1939	Inc. or dec. compared with May, 1938
Eire	£32,369	+ £1,442	*	—	*	—	*	—
Channel Islands	10,280	− 4,296	*	—	*	—	*	—
Palestine	7,036	+ 1,641	*	—	*	—	*	—
British West Africa	12,379	+ 2,338	*	—	*	—	*	—
Union of South Africa	189,971	+ 15,070	£46,524	+ £1,871	£25,207	+ £385	£47,593	− £71,791
British India	110,222	+ 18,693	4,008	− 8,935	12,988	+ 1,181	50,836	+ 11,341
British Malaya	49,927	+ 23,112	*	—	*	—	5,942	− 3,941
Ceylon	11,237	− 2,025	*	—	*	—	*	—
Hong Kong	9,377	− 6,150	*	—	*	—	*	—
Australia	190,913	− 7,703	19,943	+ 14,335	9,267	− 11,608	36,435	+ 13,143
New Zealand	100,864	+ 23,225	*	—	8,172	+ 1,349	18,227	− 1,716
Canada	13,325	+ 2,850	3,177	+ 2,471	4,653	− 5,487	2,316	− 4,236
Other British Countries	71,962	+ 12,029	18,621	− 9,761	15,050	+ 498	30,099	− 8,330
Soviet Union	2,950	− 36,433	*	—	*	—	*	—
Sweden	12,385	+ 2,051	*	—	*	—	*	—
Denmark	11,766	− 364	*	—	*	—	*	—
Netherlands	17,833	− 857	*	—	*	—	6,090	+ 2,758
Belgium	9,554	− 2,104	*	—	*	—	*	—
France	29,187	+ 13,802	*	—	*	—	2,519	+ 696
Portugal	3,755	− 3,986	*	—	*	—	*	—
Spain	163	− 422	*	—	*	—	*	—
Italy	4,115	− 4,101	*	—	*	—	*	—
Greece	2,823	+ 154	*	—	*	—	*	—
Rumania	25,215	+ 7,265	*	—	*	—	*	—
Egypt	11,216	− 14,480	*	—	*	—	571	− 1,026
China	9,023	+ 4,323	*	—	*	—	7,417	+ 6,768
Brazil	4,508	− 12,185	*	—	*	—	*	—
Argentina	48,559	− 24,526	*	—	*	—	2,338	+ 629
Other Foreign Countries	103,782	+ 220	17,845	− 8,343	35,184	− 22,899	31,927	− 32,982
Total	£1,106,696	+ £8,583	£110,118	− £8,362	£110,521	− £36,581	£242,310	− £88,687

* Not classified separately. Vacuum cleaners are included in Table I but not in Table II.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

PRESENTATIONS were made to three retiring members of the staff of Drake & Gorham, Ltd., at the annual garden party given by Mrs. Bernard Drake, at Copyhold, Cuckfield, Sussex. Following a short speech wishing them good health and long life made by a member of the staff representing their friends and colleagues, Mrs. Drake (wife of the late chairman and founder of the company) handed the gifts to **Messrs. A. Payne, B. Hackman** and **R. Poole,** who had completed fifty, forty-two and thirty-two years' service, respectively.

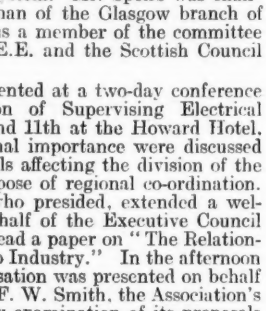
Mr. H. M. Speirs, B.Sc., who was elected president of the Electrical Contractors' Association of Scotland for the ensuing year at the recent annual conference of the Association, reported elsewhere in this issue, was born in Glasgow and educated at the Glasgow Academy. He received his technical education at the Glasgow University and the Royal Technical College, Glasgow, later proceeding to Grenoble University, France. His practical experience was obtained with Brown Boveri & Co., Baden, Switzerland. For three years he was lecturer in electrical engineering at Glasgow University, and subsequently he founded his own business in 1924. He has carried out much interesting work, including a part of the Northern Ireland system. Mr. Speirs was chairman of the Glasgow branch of the Association in 1936-37. He is a member of the committee of the Scottish Centre of the I.E.E. and the Scottish Council of the N.R.E.I.C.

Mr. H. M. Speirs

Eighteen districts were represented at a two-day conference of delegates of the Association of Supervising Electrical Engineers, held on June 10th and 11th at the Howard Hotel, London, when matters of national importance were discussed and views exchanged on proposals affecting the division of the country into groups for the purpose of regional co-ordination. Mr. J. J. Smith, A.M.I.E.E., who presided, extended a welcome on the opening day on behalf of the Executive Council to the provincial delegates, and read a paper on "The Relationship and Value of the A.S.E.E. to Industry." In the afternoon a memorandum on area reorganisation was presented on behalf of the Executive Council by Mr. F. W. Smith, the Association's vice-chairman, and a preliminary examination of its proposals was made. On the Saturday evening a dinner was held at the hotel, which the provincial delegates and members of the Executive Council attended with their ladies. At the Sunday morning session there was a full attendance, and Mr. J. J. Smith again presided. Further discussion of the proposed scheme of area reorganisation resulted in important decisions being made for consideration by the Executive Council.

Mr. R. Smith, A.M.I.E.E., informs us that he has resigned from the position of chief sales engineer with Moffats, Ltd., of Blackburn.

Mr. G. H. Bowden, A.M.I.E.E., has been appointed commercial engineer to the Cawnpore Electric Supply Corporation, Ltd., and will sail on the s.s. *Mooltan* on September 15th. Since 1930 Mr. Bowden has been with the Central Electricity Board in the S.W. England and S. Wales area, and has been responsible for the management of the standardisation of undertakings and consumers' plant in Cornwall and South Wales. His previous appointments included those of technical electrical engineer for Dorman, Long & Co.'s brickworks, coke ovens and collieries in the Ferryhill (Co. Durham) area, and assistant electrical engineer on the staff of the North-Eastern Electric Supply Co., power department, and in the power stations and sub-stations department. Mr. Bowden has contributed several articles to the ELECTRICAL REVIEW, mainly on power station and distribution matters.



[Elliott and Fry, Ltd.

Mr. G. H. Bowden

Mr. W. G. Barnett, a director of Barnett & Soans, Ltd., electrical engineers and contractors, of Burton-on-Trent, was married on June 14th to Miss Margaret Acton Wain.

Mr. N. T. Smith, borough electrical engineer of South Shields for the past three years, who is leaving to take up the position of borough electrical engineer of Warrington, has been presented by the chairman of the South Shields Electricity Committee (Ald. G. H. Linney) with a silver cigarette case and automatic lighter from the staff of the Electricity Department.

Mr. W. H. Miller, A.M.I.E.E., has resigned from his position as chief draughtsman and switchboard lay-out engineer with Ferguson, Pailin, Ltd., to take up an appointment with Lomas & Baynes, Ltd., drawing office stationers and commercial photographers, of Manchester.

Mr. W. H. Miller

The Council of the Institute of Fuel announces that **Lt.-Col. J. H. M. Greenly,** M.A., C.B.E., has agreed to continue as president of the Institute for a further year and will deliver his second presidential address at the Institution of Mechanical Engineers on October 19th. The Council has also decided to award the Melchett Medal for 1939 to **Mr. H. A. Humphrey,** M.Inst.C.E., M.I.Mech.E., M.I.E.E., late consulting engineer to Imperial Chemical Industries, Ltd., for the outstanding work he has done in the development of fuel and appliances in connection therewith. He will deliver the Melchett Lecture following the presidential address. The Melchett Medal itself will be presented at the annual dinner and dance of the Institute which is being held at the Connaught Rooms the same evening.

Mr. C. G. Du Cane, B.A., M.Inst.C.E., M.I.Mech.E., has been elected chairman of the Association of Consulting Engineers for the year 1939-40.

Mr. W. R. T. Willis, who recently severed his connection with Crompton Parkinson, Ltd., to take up the position of London sales manager for Ensign Lamps, Ltd., has now been promoted to the position of general sales manager, in complete control at Preston.

Mr. H. G. Harris and **Mr. H. J. Garbutt** have been appointed directors of Platt Brothers & Co., Ltd. Mr. Garbutt, who has been in the employ of the company for thirty-nine years, will continue as secretary of the company and certain of its associated companies.

Mr. Harris has been with the company for ten years and he will continue to act as controller of purchases to the group of firms forming the merger of Textile Machinery Makers, Ltd., and sales manager of the general engineering section of the company's works. He is a member of the Institution of Mechanical Engineers, the Institute of Metals and the Iron and Steel Institute.

Mr. R. G. Mukherji, M.Sc., A.M.I.E. (Ind.), who is on the staff of the Electrical Branch, Government of Bengal, is returning to India after a stay in this country, during which he has been studying modern generation and distribution practice. While here he spent some time with the Central Electricity Board (operation, transmission and technical departments), and with the Northmet Co. at Brimsdown.

Mr. D. B. Taylor, B.Sc.(Eng.), A.M.I.E.E., A.I.Mech.E., has been appointed distribution superintendent to the Swinton and Pendlebury Corporation. Mr. Taylor, who has previously held posts with Pirelli-General Cable Works, Ltd., and the Hackney, Hammersmith, and Hampstead Borough Councils, is at present with the Altrincham Electric Supply, Ltd. He is taking up his new duties early next month.

Mr. M. S. Mason, A.M.I.E.E., borough electrical engineer, of Worksop, has resigned his position, having been appointed engineer to Electrical Facilities, Ltd. Mr. Mason, who takes up his new duties in July, has been with the Worksop Corporation for the past eleven years.

The staff annual outing of Thorn Electrical Industries, Ltd., took place on June 17th, when 500 members attended. Two parties were arranged, one going to Clacton and the other to Margate. The occasion was favoured with fine weather, and both parties had an enjoyable time.

A meeting of the General Council of the British Standards Institution was held recently when **Sir Frank Heath,** G.B.E., K.C.B., resigned the chairmanship and **Sir Percy Ashley,** K.B.E., C.B., formerly secretary and now a member of the Import Duties Advisory Committee, was unanimously elected as chairman for the ensuing year.

Since the appointment of Mr. M. A. Muller as general manager of Electrical Commodities, Ltd., and Sparton Refrigeration Co., reorganisation in the radio factory has taken place. **Mr. A. E. Falkus,** B.Sc. (Eng.), A.M.I.E.E., has joined the company in the capacity of designer, chief engineer and works manager. Mr. Falkus was for over seven years with Standard Telephones and Cables and the International Standard Electric Corporation, including four years' foreign service, and also for over five years with E. K. Cole, Ltd., as senior designs engineer, as well as for one year with the Signals Experimental Establishment of the War Department.

Representatives and head office executives who attended the recent M.E.M. sales conference

Mr. J. Oliver has retired from Carron Company after fifty-five years' service, and has been presented with an inscribed all-electric radio set. Mr. Oliver was latterly the company's outside representative for heavy gas, coal, steam and electric cooking apparatus.

The Midland Electric Manufacturing Co., Ltd., held its eighteenth sales conference at the head office and works at Tyseley, Birmingham, on June 12th and 13th. In addition to the business sessions opportunity was taken to inspect various extensions made to the works since the last conference. The social side was not neglected during the conference, the dinner being held at Chadwick Manor on Monday evening, while on Tuesday a motor-coach trip was made round Warwickshire, followed by an evening visit to the theatre.

A good number of ex-Dick, Kerr members foregathered at the Holborn Restaurant for their third re-union and dinner on June 16th. Although not quite so many as on the last occasion, all present spent a most enjoyable evening, the Dick, Kerr spirit of friendship being the keynote of the evening. **Mr. D. Kerr,** elected last year as permanent chairman of the Association, was in the chair, and Mr. F. Bourne was an honoured guest. The meeting expressed particular pleasure at the presence of Mr. H. A. Cox, who was formerly in charge of the test bed at Preston Works.

Mr. W. A. Jackson, M.I.Mech.E., Associate I.E.E., F.B.H.I., general sales manager of the Telephone Manufacturing Co., Ltd., has now joined the board of directors.

OBITUARY

Mr. H. Pike.—We regret to announce the death, on June 8th, of Mr. H. Pike, of the British Thomson-Houston Co., Ltd. Mr. Pike had been with the company for more than twelve years and since 1934 had been manager of the company's Colchester depôt.

Parliamentary News

(BY OUR SPECIAL REPORTER)

Village Supplies

IN the House of Commons on June 14th, Mr. De la Bere asked the Minister of Transport whether he could give the total number of applications from villages to have electricity supplied which had been reported and considered by the Electricity Commissioners for the years 1936, 1937 and 1938, and had been refused on account of their having been considered uneconomic.

Captain Wallace said that the numbers of communications received in his Department and by the Electricity Commissioners from individuals or communities regarding extensions of supplies of electricity in 1936, 1937 and 1938 were 398, 356 and 368 respectively. The Electricity Commissioners had no power to require undertakings to give supplies. When communications relating to extensions of supplies were received it was their general practice to refer them to the undertakers concerned, who usually indicated the terms on which they were prepared to give the supplies. These terms were communicated to the prospective consumers, with whom it rested to decide whether they would accept them. It was not practicable to obtain a definite and accurate figure of the number of cases in which a supply had been refused on the grounds that it was uneconomic.

Supply Companies' Operations

Mr. De la Bere asked the Minister of Transport whether he would give an assurance that an official inquiry into the workings of the electricity supply companies would be held, and particularly in connection with those concerns that were governed and controlled by holding companies.

Captain Wallace said he was not sure what form of inquiry his hon. friend had in mind, but a Select Committee appointed by the House of Lords was at present engaged upon an inquiry into the subject of control of electricity undertakings by holding companies.

Electrical Interference

On June 19th Mr. Gallacher asked the Postmaster-General how many complaints were received by his department in the twelve months to the last convenient date concerning wireless interference caused by neon-sign installations; and whether any action was contemplated to compel owners of these installations to fit interference-suppression devices.

Major Tryon said that about a thousand complaints were received during the year 1938 concerning interference with wireless reception caused by neon sign installations. In most of these cases the owners of the installations agreed to fit interference-suppression devices, although there was at present no legal power to compel them to do so. Inquiries regarding the possible scope and operation of a new Wireless Telegraphy Bill to deal, *inter alia*, with the question of electrical interference with wireless reception were being actively pursued. The problem was, however, one of great complexity, involving consultation with many interests which would be affected; and some time must elapse before these consultations could be completed.

Telephone Equipment "Rings"

Mr. Montague asked the Postmaster-General whether, in view of the fact that the group of manufacturers of telephone equipment which operated as a "ring" were engaged upon non-competitive agreements with his department, he would assure the House that the public would be protected in regard to profits made by these firms.

Major Tryon said that the bulk equipment agreement to which the hon. member referred was made several years ago with a group of contractors in order to secure to the Post Office the benefits of standardisation of equipment, planned production and the pooling of patents. Prices had been revised from time to time as the agreement fell due for renewal. These conditions seemed to him substantially different from those governing armament contracts, but certain additional facilities had been accorded by the contractors for checking the reasonableness of prices and a detailed investigation was now proceeding as a preliminary to a new agreement.

Meter Charges Bill

On June 20th, Mr. De la Bère asked leave to bring in the Electricity Supply (Meter Charges) Bill, to limit the charges which may be made by electricity undertakings in respect of the hire of electricity meters and to amend the Electricity Supply Acts, 1882 to 1936. Leave was granted and the Bill was brought in.

Sequel to Apprentice's Death

THE Second Division of the Court of Session, Edinburgh, last week approved an issue for the trial by jury of an action arising out of the death of Edward Hunter Pelling, an 18-year-old apprentice plumber. The youth was stated to have been walking along a "cat-walk" above the ceiling of the house when he came into contact with a metal conduit pipe containing the wiring of the house, and also with two vertical water expansion pipes. The result was that he received a fatal shock.

The action, in which the father claims £1,500 damages, was brought against the County Council of Renfrew, which erected the house under a housing scheme. The question before the Court was as to whether the action should be tried before a judge and jury or before a judge sitting alone.

The Lord Justice-Clerk said that there were questions of fact to be decided in the case, and it might be that there were questions of law, but after listening to counsel for the respondents, His Lordship did not think that special cause had been shown for withholding the case from a jury. Lords MacKay, Wark and Jamieson concurred.

COMMERCIAL AND INDUSTRIAL NEWS

Bolton Electric Vehicle Exhibition. Weymouth Bandstand Installation. New Showrooms at Mansfield. A Service for Factory Construction. New B.T.H. Offices.

Bolton Electric Vehicle Exhibition

CONSIDERABLE interest was taken in a special exhibition of electric vehicles organised by the Electric Vehicle Association of Great Britain at the Spa Road Electricity Works, Bolton, on June 13th and 14th. Various types of battery-propelled vehicles for different classes of work, including that of public authorities, were on view, and many inquiries were made by local tradesmen. Ald. Entwistle (Mayor of Bolton), in opening the exhibition on June 13th, said that there was something more than a mere saving in running costs by the use of electrically propelled vehicles—they were definitely cleaner and did not emit fumes. Councillor Longworth, chairman of Bolton Electricity Committee, who presided, said he would like to see town transport going over to electric vehicles so as to make up the load lost through the supersession of trams. Bolton was gradually scrapping its trams and making use of Diesel and petrol buses. He had personally advocated the installation of trolley-buses, but the data was not sufficient to convince the members of the Town Council that trolley-buses could be operated more cheaply than either oil or petrol engines. Mr. H. E. Annett, chairman of the North Western Area of the Association and electrical engineer and manager at Bolton, said that they were not there to advocate electric vehicles for every sort of service, but merely for house to house service and town deliveries. Among the special advantages of this type of vehicle were low operating cost, reliability and ease of charging. In the event of war the use of petrol would be restricted and the people with fleets of electric vehicles would be in a favourable position.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the "cost-of-living" figure at June 1st (53 per cent. above the 1914 level) will not involve any alteration in wages on the third pay-day in July.

Weymouth Bandstand Lighting

The lighting scheme at the new Weymouth Bandstand was prepared by Falk, Stadelmann & Co., Ltd., and their associate company, Ionlite, Ltd., in collaboration with the architect, Mr. V. J. Wenning, the installation comprising a combination of neon tubes and tungsten filament lamps in appropriate fittings. The café block, the shelters and the bandstand block, together with the pylons erected thereon, are all provided with a double line of luminescent tubing, the upper one being opal green and the lower opal red, a combination which produces a warm and pleasing amber while the lower red tube effects a very attractive shading on the walls of the structure. Approximately 2,500 ft. of tubing is used.

For the tungsten lighting in the forecourt, there are four concrete columns each carrying a specially designed floodlight unit at the top with two subsidiary spherical units supported on the arms. These standards are situated in the flower beds. In the entrance foyer, apart from the general lighting obtained from the fifteen ceiling lights, ten Vividek panels showing local beauty spots, with the pelmet and flower beds, are illuminated and form an interesting decoration. The control equipment for the whole of the installation is accommodated in a room behind the panels on the right-hand side.

The main lighting in the centre of the café is obtained by three ceiling fittings. Particular attention had to be given to the lighting of the bays at each end and the balcony facing the stage so that a clear vision could be given along the shore and toward the bandstand from any part of the café. This has been achieved by the use of fittings recessed in the ceiling.

At the bandstand proper, the promenade is lighted by sixteen lanterns mounted upon concrete columns. These are provided with amber lamps. Each of the shelter exteriors besides being outlined with neon lighting is provided with trough lighting fitted in 15 ft. sections intersected by non-luminous sections 5 ft. in length. The shelter areas are lighted with fittings recessed in the ceiling. Supplementing the lighting of the central area, four floodlights have been arranged on the roof of the shelters to level up the intensity here. For the stage neon lighting has been applied to the two pylons and the eaves of the bandstand and the various roofs at the rear. Under the eaves in the front seven graduated, semi-recessed fittings add to the decorative effect. The interior is provided with three lines of trough lighting, while the decorative windows at the rear of the bandstand are floodlighted from the roof of the green room and dressing rooms. The stage lighting is provided by a three-colour footlight and batten, dimmer controlled, and two 1,000-W spotlights. The control gear is so arranged that various combinations can be effected at will. The wiring installation was carried out by Bennett & Escott, Ltd., of Weymouth.

E.D.A. Salesmanship Certificate

There were 183 entries for the fourth final examination for the E.D.A. salesmanship certificate held on April 26th and 128 students passed, two of them with distinction. The students gaining the highest marks were Miss S. M. J. Wilcox (Wimbledon Electricity Department) and Mr. C. J. Cabbold (East Anglian Electric Supply Co.).

Hotel, Restaurant and Catering Exhibition

Over 100 stands have already been booked for the Hotel, Restaurant and Catering Exhibition which will be held at Earls Court from November 23rd to December 1st. Revised lay-out plans of the Exhibition Hall incorporating additional space have now been issued. All forms of kitchen engineering and stillroom and service apparatus are already strongly represented. Labour-saving auxiliary appliances and notably food preparation machines are also to the fore.

New Mansfield Showrooms

The first electricity showrooms in Mansfield were opened in 1926, but these soon became inadequate, and in April, 1938, they were vacated for temporary showrooms until the new building in Regent Street became available. This has now been completed and was formally opened on Tuesday last by Sir Cyril Hurcomb (chairman of the Electricity Commission).

The front elevation is designed in free classical style to harmonise with the adjoining buildings, and will form the central feature of the street façade when the development is fully completed. On the front of the building is fixed a projecting canopy upon which are fitted floodlights for illuminating the façade. The main showroom on the ground floor has been laid out on broad lines with a main central doorway. There are two large display windows on the main thoroughfare, and two smaller enclosed windows at the side of the recessed doorway. The showroom has been designed to enable

Some of the neon lighting of the bandstand at Weymouth and (right) the Café

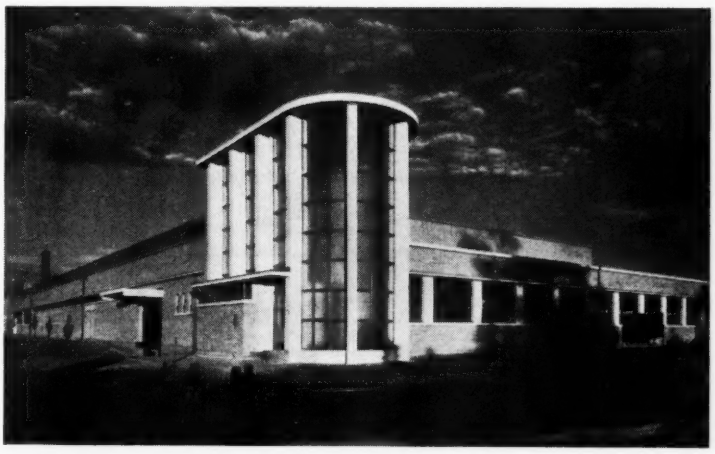
apparatus to be effectively displayed while maintaining the idea of spaciousness.

On the first floor there is a demonstration room with seating accommodation for nearly 100 persons, in which a stage and kitchen have been incorporated. The stage has been equipped with colour-change lighting, and this system of lighting has also been installed in one of the show windows.

The second floor comprises a large room which can be used for special displays and demonstrations. The illumination of the main showroom is effected by a large central fitting of modern design, supplemented by wall brackets. In addition, there is cornice lighting in colour. The demonstration room is provided with indirect cornice lighting operated through dimmers. The heating of the entire building is by thermostatically controlled convector heaters. The electrical installation was designed by Mr. A. Latham, the borough electrical engineer, and carried out by the staff of the electricity undertaking. Pictures appear on page 932.

Factory Construction Service

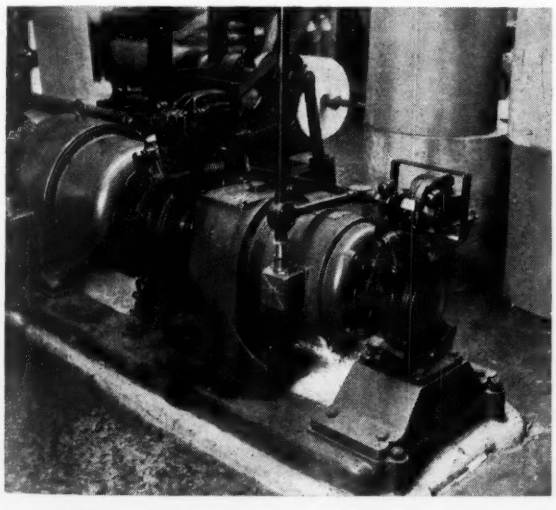
Upon the location, design and construction of a new factory depends the future of a business. Yet too often these problems are dealt with hurriedly and without sufficient preliminary investigation. A complete service that embraces site selection, design and factory construction, planned and organised by Commercial Structures, Ltd., London, consists of the combined and co-ordinated activities of all those specialists whose services have previously had to be separately employed—surveyors, engineers, architects and builders. Working together under one roof, these specialists co-operate to provide one complete service which takes care of everything from site to building. The company is able to undertake, without depending on sub-contractors, the whole of a building contract—steelwork, reinforced concrete, heating and ventilating installations, electrical and power installations, joinery, plumbing, &c. This enables every job to be accurately planned in advance. The service, however, is a flexible one, and sections may be used separately. A number of factories constructed to a standard design are always held available. These buildings are planned so that they can be rapidly adapted to suit individual requirements.



Factory planned and constructed by Commercial Structures, Ltd.

Electric Drive for Printing Machinery

Four-colour printing machines at the works of Waxed Papers, Ltd., have been fitted with Brook multiple drive to obtain low-speed inspection of the printed matter during the setting-up period. Control throughout is by Allen West contactor gear. A pony motor which can be inched or braked at will turns the main motor through a Croft gear and Broad-bent free-wheel clutch. Once the printing is correct, the main 25-HP Brook motor is started and the intermediate clutch disconnects the pony motor which closes down. This press is one of six at the works, where over 500 HP of Brook motors is installed. The consulting engineer was Mr. D. Winton Thorpe.



Brook multiple drive for a printing machine

German Electrical Exports

The exports of electrical manufactures from Germany in 1938 formed one of the few branches which did not participate in the aggregate diminution in the export trade in that year. According to the Institute for Economic Research, the value of the electrical exports increased from 304.4 million Reichmarks in 1937 to 317.4 millions last year. It is stated that Germany last year supplied 41.9 per cent. of the imports made by the countries in Europe, 16.6 per cent. of those in Asia, 6.6 per cent. in Africa, 16.2 per cent. in America, and 3.2 per cent. in Australia.

Kelly's Directory

Kelly's Directory of Merchants, Manufacturers and Shippers of the World for 1939, which has just been published, consists of two volumes as in previous years. Volume I deals with foreign countries and Volume II with the British Empire. This directory has for long been regarded as an indispensable work of reference by import and export houses, and commercial firms whose interests are wholly confined to home trade find it no less valuable. The larger part of Volume II deals with Great Britain, and this section is in fact a directory of the wholesale and manufacturing trades of Great Britain. To facilitate reference all names are classified both alphabetically and by trades. The remainder of Volume II is devoted to the rest of the British Empire. Here the names of agents, exporters, importers, wholesale merchants and manufacturers are arranged alphabetically by trades and towns under the various geographical divisions. Volume II thus covers the wholesale trade of the British Empire. In Volume I will be found particulars regarding all the countries of the world outside the British Empire. The information in it is arranged similarly to that in the Dominion and Colonial section of Volume II. The Directory is published by Kelly's Directories, Ltd., 186, Strand, W.C., at 64s. for the two volumes.

Lamp Price Reduction

The General Electric Co., Ltd., announces a reduction in price of "Osram" architectural lamps as from June 1st; this reduction applies to the white opal, colour-sprayed, and coloured opal types.

Works Visit

In connection with the London spring meeting of the Institution of Mechanical Engineers a visit was paid to the Fraser & Chalmers Engineering Works of the G.E.C. at Erith, Kent, on June 10th. On arrival at the works the party, which included Mr. H. L. Guy (vice-president), and Major W. Gregson and Mr. B. J. Tams (members of the Council), was received by Messrs. F. Lonsdale and E. A. Pitcher, the joint general managers. During the tour of the works special interest was taken in the turbine shop, where a 20,000-kW, 3,000 RPM turbo-alternator set for Darlington Corporation was seen completed and ready for test. Other machines seen under construction included 30,000-kW turbines for various municipalities in this country and a 37,500-kW turbine for Orlando power station, Johannesburg.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted:—Masters & Shepherd, Sparkbrook, Birmingham, 12; S. H. Nicholds & Co., Ltd., Birmingham, 19; G. R. Simmons, Marple, nr. Stockport; A. H. King & Son, 118, Bridge Road West, Battersea, London, S.W.11; Lloyd & Foggin, Liverpool, 23; H. H. Lamb (trading as Lamco Electric), Aston, Birmingham, 6; Ward Electrical Engineering Co., Ltd., 155, Wardour Street, London, W.1; Smith Bros. (Construction), Ltd., Sparkbrook, Birmingham, 11. At the same meeting seven applications were declined.

Progress of Tin Research

The third general report of the International Tin Research and Development Council is a brief survey of the work done during 1938. The Council has built new laboratories and offices at Greenford, Middlesex, and is experiencing the advantages of the permanent staff now concentrated there. There

was a record number of requests for information and assistance, and many of the inquiries were dealt with in the Council's laboratories and some have opened up new lines of research. A new electro magnetic instrument for measuring the thickness of tin coatings on steel has been submitted to commercial users, and a number of the machines are undergoing trials in this way. Hot-tinning has been the subject of many inquiries, as has electro-tinning. In view of the success under industrial conditions of the latter method of depositing coatings of any desired thickness, a booklet of working instructions on "Electro-Tinning" has been issued for the use of all who are using tin-lined equipment. Copies of the report are available from the Tin Research Council, Fraser Road, Greenford, Middlesex.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price June 21st	Fortnight's inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate... ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4½d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¾d.	—
c ,, Wire, basis ... ... ,,	8¼d.	—
c Copper Tubes (solid drawn) ... ,,	1/0¼d.	—
g ,, Bars (best selected) ... per ton	£78	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£48	15s. dec.
d ,, ,, Wire Rods ... ,,	£52 10s.	£1 dec.
d ,, ,, H.C. Wire ... per lb.	7¾d.	¼d. dec.
f Ebonite Rod ¼" dia. & up ... ,,	1/10 to 2/3	—
f ,, Sheet ⅛" thick & up. ... ,,	1/4 to 1/8	—
n German Silver Wire, Nos. 1 to 12 .. ,,	2/4	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	7¼d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 15s.	—
i ,, Wire galv. No. 1 P.O. Qual. ... ,,	£23	—
g Lead, English Pig ... ... ,,	£16 15s.	5s. inc.
g Mercury ... ... per bot.	£16 10s.	10s. inc.
e Mica (in original cases) small ... per lb.	1/– to 2/6	—
e ,, ,, ,, medium ... ,,	7/6 to 15/–	—
e ,, ,, ,, large ... ,,	17/6 to 22/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1d.	—
p ,, ,, rolled strip & sheet ,,	11¼d.	—
p ,, ,, wire ... ... ,,	1/1¾d.	—
o Platinum ... ... per oz.	£7 10s.	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	—
g Spelter ... ... per ton	£14 1s. 3d.	1s. 3d. inc.
g Tin, Block (English) ... ... ,,	£229	£3 10s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

It should be noted that prices quoted for copper do not include any allowance for insurance against war risks.

New B.T.H. Rugby Offices

The new block of offices erected at the headquarters of the British Thomson-Houston Co., Ltd., Rugby, is for the accommodation of the engineering and commercial offices and provides ample space for about 780 members of the company's staff. The building is rectangular and the overall dimensions are 388 ft. long, 50 ft. wide and 63 ft. high in the centre. It contains eighty-seven rooms.

In the centre on the ground floor is a spacious hall, from which a broad stairway leads to the upper floors; these floors are served also by two automatic passenger lifts. Generally, the ground floor includes the commercial offices, the first floor, the engineering offices, and the second floor the drawing offices. The passenger lifts in the centre of the building are arranged for dual control—either by push-button or by car switch. The control panel was specially designed and manufactured in the B.T.H. works. Levelling at each floor is controlled by B.T.H. "Pliotron" units, and the motive power is provided by commutator motors.

New block of offices of the B.T.H. Co. at Rugby

Cables for the lighting and other electrical services are brought in through tunnels in the concrete foundations to the main switchgear in the basement. Circuits for the electrical services in the offices are run to fourteen distribution boards on the various floors and wiring is run from these boards in conduit cast in the concrete floors to terminal boxes for the lighting service points. There are over 1,600 of these terminal boxes, and the amount of conduit exceeds 24,000 ft. All internal and G.P.O. telephones, speaker-phones, Ediphones, buzzers and power points for cleaners are wired up on the key conduit underfloor system.

French Electric Refrigeration Development

Interesting figures on the development of electric refrigeration in France and the French colonies have been collected by the Société pour le Developpement des Applications de l'Electricité. According to these, there are 45,977 refrigerators in France, representing a total connected load of 12,144 kW. In addition to these domestic installations, there are 34,369 industrial and commercial refrigerators, with a total connected load of 27,260 kW. This does not include 3,402 ice-cream installations, principally in restaurants and tea shops.

Among the colonies the one which has shown the greatest development is North Africa, where there are 13,357 domestic installations, representing 4,211 kW, and 2,484 industrial installations, with a connected load of 3,154 kW. Next comes Indo-China, with 2,495 domestic and 41 commercial installations. Senegal has 867 domestic and 19 commercial installations for 5,151 consumers; Madagascar has 256 domestic and 45 commercial installations for 7,300 customers; Martinique shows 162 domestic installations for 6,000 consumers; and Tahiti also shows good results with 85 domestic and two commercial installations for 600 consumers.

The "Mauretania"

With reference to the description of the electrical apparatus on the "Mauretania" which appeared in our last issue, Osler & Faraday, Ltd., state that they supplied about 75 per cent. of the electric lighting fittings including those for all the entrances and staircases, library, children's room, many suite rooms and vestibules in the cabin class, entrances and staircase in the tourist class, and stairway and the bulk of the accommodation of the third class.

The British Thomson-Houston Co., Ltd., in collaboration with the designers and architects responsible for the decoration of the more important public rooms, such as the cabin class grand hall and smoke room and the tourist dining room, prepared special lighting schemes. These included cornice lighting with lay-lighting and illuminated panels incorporated as architectural features, numerous special decorative effects, ceiling fittings and wall brackets.

Kettering Hospital Carnival

"Mary's Garden," Kettering Electricity Department's entry in the Kettering Hospital Carnival procession on June 17th, secured first prize in its section. Plants and flowers grown in an electrically heated greenhouse were used to decorate the lorry, part of which represented an old-world garden with pigeon loft, rustic arch, seats, and a table with "Mary" at tea. A huge flower basket, also laid out as a garden, was fixed overhead. The sides of the lorry bore a revised version of the nursery rhyme.

New Catalogues and Lists

Pressed Steel Co., Ltd., Cowley, Oxford.—A series of leaflets dealing with various types of evaporators, details of a new built-in refrigerator and booklets dealing with refrigeration in the fish and poultry trades, public and private institutions, milk-bars and the ice-cream trades, meat trades, provisions, and dairies. Also leaflets relating to ice-cream conservators, bottled beverage coolers and condensing units.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—A folder dealing with cables supplied for R.M.S. "Mauretania."

Blackstone & Co., Ltd., Stamford.—A new periodical known as the *Blackstone Bulletin*.

Sun Electrical Co., Ltd., 118/120, Charing Cross Road, London, W.C.2.—A 21-page illustrated catalogue of "Propelair" fans; also a supplementary accessories catalogue and price list.

Julius Sax & Co., Ltd., 27, Lower Mall, Hammersmith, London, W.6.—A complete 80-page, bound in a stiff cover, and dealing with bells, indicators, transformers and luminous signalling apparatus.

Partridge, Wilson & Co., Ltd., Davenset Works, Evington Valley Road, Leicester.—A folder dealing with the new Wilson mass-produced electric vehicle.

Bowthorpe Electric Co., Ltd., Goodtric Works, Purley Way, Croydon.—"Up the Pole"—leaflets dealing with recent improvements in overhead line fittings.

Bx-Plastics, Ltd., 4, Chiswell Street, London, E.C.1.—A folder describing the company's "Plastics Centre" at the above address.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—A complete 68-page illustrated catalogue of low-voltage switch and fuse gear.

H. J. Scott & Co., Ltd., Volt Works, Ravenhill Avenue, Belfast, Northern Ireland.—A price list of "Scott" motors.

The Gramophone Co., Ltd., H.M.V. Household Appliances, 363, Oxford Street, London, W.1.—A 25-page electric refrigerator sales manual on art paper.

Allen West & Co., Ltd., Lewes Road, Brighton.—A folder relating to new and oil-immersed direct switching circuit-breaker.

Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Longsight, Manchester, 12.—A new book, bound in a stiff cover and including technical data and test reports on "Aeroflex" fuses.

Watson & Sons (Electro-Medical), Ltd., Sunic House, Parker Street, London, W.C.2.—Details of X-ray and electro-medical apparatus.

Associated Electric Vehicle Manufacturers, Ltd., 231-3, Grand Buildings, Trafalgar Square, London, W.C.2.—A catalogue and "Morrison" and "Electricars" electric trucks.

B.E.N. Patents, Ltd., Hughenden Avenue, High Wycombe.—A folder entitled "Protection for Essential Industries."

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.—A leaflet relating to mercury and sodium lamps.

W. Sanders & Co. (Wednesbury), Ltd., Falcon Electrical Works, Wednesbury.—A leaflet dealing with a new clock connector.

John Dugdill & Co., Ltd., Hazel Grove, Stockport.—A catalogue of movable focusing self-sustaining lighting fitting.

British Insulated Cables, Ltd., Prescot.—A leaflet on flux cored solder.

Stream-Line Filters, Ltd., Hele-Shaw Works, Ingate Place, S.W.8.—An illustrated folder containing a detailed description of a new filter designed especially for commercial motor vehicles. It requires no routine replacements and the filtering surface is self-cleaning.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

JACKSON safety iron.
CLYPTOL red anti-crack paint.
EESLEE tape.
WE FEE handlamp.
NEW DEPARTURE bearings (agent).

A.R.P. Schemes

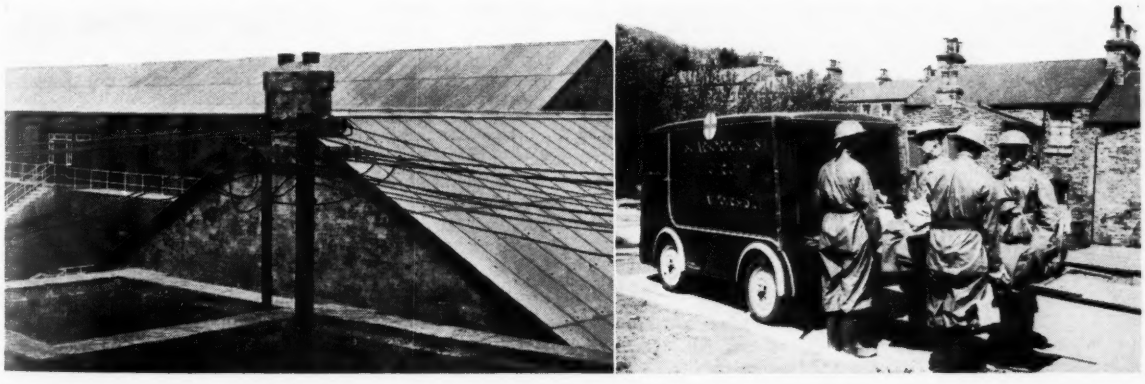
WAR-TIME headquarters with offices, underground shelters, and all A.R.P. requirements have been completed by Associated Portland Cement Manufacturers, Ltd., at the old Saxon Cement Works, Coldham's Lane, Cambridge. Electricity supply is from the grid, but to provide against a possible failure from that source an auxiliary power station has been installed for emergency and to light the dug-out shelters. For the extensive electrical installation Callender's cables were exclusively used throughout, the contractors for this being Messrs. A. E. Smith and E. J. Ellis, of Coleridge Road, Cambridge. There are eleven underground shelters, each accommodating thirty people. Lighting is from batteries. Each shelter is equipped with tools, electric torch, fire extinguisher, first-aid materials, lavatory, and drainage.

The main office is 160 ft. by 60 ft., and houses tables for the clerks, portable "private" offices, and telephones, while all positions for machines are prepared and wired. Other and smaller offices are similarly equipped, the total accommodation being for staff of 300. Ordinary overhead direct lighting is installed here. Heating is partly central and partly by electric fires, of which there are 300. Power for the auxiliary three-phase supply is obtained by an 80-HP oil engine in a dug-out, with an alternator and a Metro-Vick transformer. An underground cable leads into a pump-house at the edge of the lake, and here there is a 50-HP motor with starter to supply the fire hydrants, a 6-in. suction pipe being used. The power-house equipment includes a valve rectifier (Nevelin Electric Co., Ltd.), a DC supply being required for the offices (machines) and for charging the batteries.

In the ambulance rooms air-conditioning will be by electric motors, and Jackson boilers are installed for sterilising, with Sadio heaters for other hot water. Immersion heaters are used in the undressing and dressing rooms (decontamination department). The canteen equipment includes a large cooking range and boiler. To add to electrical reliability all the main distribution is duplicated, and while the distribution cables are overhead they are easily accessible, being mounted on 4-in. angle iron erected on walls and clearing the flat roofs. All insulators are of the Callender-Brown type.

Further consideration is being given to the question of an adequate emergency supply of electricity, and additions may be made. At present the installation includes 238 lighting points, 35 15-A circuits for fires and boilers, six 15-A and thirteen 2-A DC circuits for batteries and office machines, a 50-HP motor for the fire pump, and sixteen 15-A immersion heaters. The amount of Callender cable used was 7,000 yd.

An important part of the A.R.P. work which is engaging the attention of electricity supply undertakings is the organisation and training of personnel for such essential services as fire fighting, first aid, and decontamination. Scarborough Corporation Electricity Department has three squads of six men each for fire fighting, first aid and decontamination, and there are trained reserves as well to fill every position if required. Each squad has passed through an intensive course of training by experts for the special duties involved, as well as instruction on general A.R.P. work. In addition to these special services there is also, of course, trained personnel in readiness for emergency duties in connection with the maintenance of communications, the repair and maintenance of the distribution system, and for working in conjunction with the ordinary civil A.R.P. organisation. Our picture shows first-aid men lifting a "casualty" into the ambulance (one of Department's electric vans) during A.R.P. practice.



Callender distribution cables at the A.R.P. quarters of Associated Portland Manufacturers, and (right) a "casualty" during A.R.P. practice at Scarborough

Brown Bros., Ltd., have sent us a leaflet (No. P.650), which they have just issued of A.R.P. equipment, which includes fire fighting apparatus, tools for demolition and rescue work, hand lamps, torches and first-aid outfits.

Some months ago Glenfield & Kennedy evolved a comprehensive emergency repair system for water mains and recently a demonstration which proved successful was given at the waterworks depôt of the Worthing R.D.C., East Preston, Sussex.

ELECTRICITY SUPPLY

Chester Power Station Steelwork Report. Approval of East Ham Electric Bath Heating Scheme. Portsmouth Council Committees and the Electricity Department.

Annan.—STREET LIGHTING DECISION.—After an inspection of street lighting at the invitation of the Dumfries County Council Electricity Department, the Annan Lighting Committee reported in favour of the metal filament type of lamp. The electrical engineer has been asked to make arrangements for the installation of specimen lamps.

Ashton-under-Lyne.—WATER HEATING CAMPAIGN.—The Electricity Department is offering its domestic consumers a free trial of an electric water heater for two months.

Barnoldswick.—OPPOSITION TO SALE OF UNDERTAKING.—Opposition to the Barnoldswick Council's selling its electricity undertaking to Electrical Distribution of Yorkshire, Ltd., is being organised, and a committee has been appointed to prepare a petition for presentation to the Ministry of Transport, the Electricity Commissioners, and the local authority. The Commissioners will be asked to hold a public inquiry. The Council's decision to obtain a bulk supply from the Yorkshire Electric Power Co. is criticised on the grounds that it might prejudice the Council's chances of retaining control of the undertaking in future. It was urged that the agreement with Nelson Corporation should be renewed.

Brighton.—NEW TURBO-GENERATOR COMMISSIONED.—Before a company numbering about 200 the Mayor of Brighton, Councillor J. Talbot Nanson, formally started the second Brush-Ljungström turbo-generator on Monday last (a description of

Inauguration of Brighton's new turbo-generator

the plant appears on pp. 907-8). Owing to the noise of working machinery, the preliminary speech-making took place on the waterfront. Councillor F. G. Field, chairman of the Electricity Committee, said that details and the lay-out of the new plant were carried out by the undertaking, and they were gratified to know that they had staff capable of doing this without outside help. In the station, the Mayor formally lighted one of the new Babcock & Wilcox boilers, and at the new generator he turned the wheel of the steam valve.

After watching the set start up the party was shown over the station, and then returned to the Pavilion, where luncheon was served, Councillor Field presiding. Toasting "The Brighton Corporation and the Electricity Undertaking," Mr. C. G. Morley New (Electricity Commissioner) said he had had no time to look into the activities of the Corporation, but he could speak of the undertaking. From 5,400 kW capacity in 1906 it had advanced to 140,000 kW in 1939. The extension of the station had been carried out most efficiently. He felt that with an undertaking like theirs the question was how could they supply the greatest number of kWh at the cheapest price. He hoped that the Electricity Committee would improve on its present low cost figures. The chairman, in reply, referred to the Committee's policy of devoting the surplus revenue to bringing electricity within the reach of all classes of the community. The Mayor of Brighton proposed "The Visitors," to which Lord Hyndley replied. Mr. W. N. C. Clinch (borough electrical engineer), proposing the toast of "The Contractors," said that the extensions were successful because the latter had co-operated with him and his staff. The Committee had introduced a new type of boiler and a new type of firing equipment, which were efficient. The turbines were the largest of their kind in this country. Mr. H. E. Midgley (Brush Co.), in reply, said that the contractors had carried out the work without taking other plant out of commission. Mr. C. H. Sparks (Babcock & Wilcox) also replied. Among others present were Sir Leonard Pearce (London Power Co.), Mr. Johnstone Wright (Central Electricity Board), and Capt. J. M. Donaldson (Northmet Power Co.).

Burton-on-Trent.—SUPPLY EXTENSIONS.—The Electricity Committee is to extend the mains at a cost of £4,921 to provide a supply to Ticknall, Ingleby and Stanton.

Carlisle.—NEW SUB-STATION.—The Town Council has authorised the erection of a sub-station at the junction of Richardson Road and Dalston Road.

Chester.—POWER STATION STEELWORK.—The Electricity Committee last week-end received the report of Mr. Harold Cane upon the steel framework of the proposed extension of the Queensferry power station. He deals mainly with the criticism that the 300 tons of steelwork in the building seems small for a building of the dimensions proposed, and states that, after making ample allowance for all loads that may be imposed on the structure, the weight of steel provided in the Corporation's bill of quantities is nearly 10 per cent. in excess of that required to provide a steel frame no member of which would be stressed beyond the limits sanctioned by sound engineering practice.

Colchester.—PROTECTING THE ELECTRICITY UNDERTAKING.—At the June meeting of the Town Council the borough electrical engineer (Mr. G. P. Dixon) submitted a special report containing proposals for the protection of the electricity undertaking in an emergency. He estimated the cost of carrying the proposals into effect at £5,639. The report is to be submitted to the Electricity Commissioners for approval.

Conway.—TARIFF CHANGES.—The Electricity Committee has decided that the existing rateable value tariff shall be extended to houses and shops (combined), including premises of doctors and dentists, unlicensed hotels, boarding and apartment houses. The "unit" charge of the rateable value tariff is to be reduced from 1d. to ¾d. and the charge for lighting of lock-up shops from 5d. to 4d. per kWh. Rebates will be made to slot meter consumers.

Darlaston.—PROPOSED SUB-STATION.—The Midland Electric Corporation for Power Distribution, Ltd., is to erect a sub-station on the Bentley site.

Denny (Stirlingshire).—ASSISTED WIRING.—The Town Council recently adopted an assisted wiring scheme.

East Ham.—ELECTRIC HEATING AT BATHS.—A letter has been received by the Finance Committee from the Ministry of Health regarding the application for a loan of £7,650 for the proposed installation of an electrical system of heating at the central baths. The Ministry has approved the scheme on the understanding that the agreement for the supply of electricity provides for a maximum sum of £2,083, the term of such agreement to be at least as long as the loan repayment period. The matter has since been discussed with the Ministry and an undertaking given that the charge for electricity for the first year will not exceed £2,083 and that a report will be submitted after 12 months' working.

Galston (Ayrshire).—DISCHARGE LIGHTING.—The Town Council has authorised the erection of 20 mercury-vapour electric discharge lamps in the main streets at a cost of £492.

"Pool" for Rural Supplies

A SUGGESTION for financing electricity supplies to outlying areas was put forward at the annual conference of the Rural District Councils' Association held at Torquay. Mr. H. C. Brown, clerk of the Ringwood and Fordingbridge Rural District Council, said that the electricity system called for overhaul. If some scheme could be devised for a pooling arrangement by the electricity supply undertakings in each region, enabling a fund to be set apart so that for every pound contributed by a local authority or a rural district a pound had to be contributed in addition out of this fund, it should help to get electricity to a number of parishes and outlying villages where at present it appeared that they had little prospect of obtaining a supply.

Rural electricity supplies were also discussed at a meeting of the Somerset Farmers' Union Executive Committee. Mr. S. J. Shackell said that outside large centres it was impossible to get electricity except at prohibitive prices. The telephone service was worked on much better lines. Better farms would keep men on the land. Also, the workers' wives must have electricity for cooking, washing and the like. Capt. A. Harris stated that the N.F.U. would probably request, through the Minister of Agriculture, an interview with the Minister of Transport in order to ascertain the intentions of the Government in relation to the expansion of electricity supplies in areas undeveloped by supply companies and to isolated premises.

Gateshead.—SODIUM TO REPLACE MERCURY.—The Town Council is to replace the mercury vapour lamps in Valley Drive with sodium lamps at a cost of £225.

Glasgow.—NEW SWITCHGEAR AT GASWORKS.—The Gas Committee has arranged for the Electricity Department to replace the wiring and switchgear at Dalmarnock gasworks at a cost of £525.

Harraton (Co. Durham).—REQUEST FOR ELECTRICITY.—On the grounds that the houses would probably be condemned within a few years, Lambton, Hetton and Joicey Collieries, Ltd., has refused the Parish Council's request to install electricity in houses in Nova Scotia. The Council is to ask the North-Eastern Electric Supply Co. to consider the matter.

Ipswich.—SUB-STATION SITE.—The Electricity Committee has obtained a site for the erection of a sub-station in the Turret Lane area.

Jarrow-on-Tyne.—OPPOSITION TO OVERHEAD LINES.—The Town Council has agreed to support the protest by Felling-on-Tyne Urban District Council against the erection of overhead lines in the Felling area.

Lichfield.—EXTENSIONS.—Permission has been obtained by the Electricity Committee to erect overhead lines to Woodhouses, Yoxall and Fradley Junction and Seedy Mill pumping station, Elmhurst.

Lichfield.—The Chasetown Electricity Co. proposes to afford a supply to houses at Gentleshaw.

London.—POPLAR.—The Borough Council is to erect a sub-station on a site in Morris Road, Poplar.

FULHAM.—The borough electrical engineer has reported that he has now been able to settle the permanent heating and lighting requirements of the power station, and he has been authorised to carry out the necessary work. The estimated cost is £11,500 (£10,000 for lighting and £1,500 for heating). In 1936 the consulting engineers advised the provision of a temporary installation owing to the difficulty of deciding the most suitable positions of the permanent lighting points before the whole of the plant had been installed.

It is proposed to purchase a strip of land at the rear of the electricity showrooms for proposed extensions.

Manchester.—NEW SUB-STATION.—The Electricity Department proposes to erect a sub-station in Mill Lane, Denton.

Newmilns (Ayrshire).—ELECTRIC LIGHTING.—The Town Council has decided to light all the streets in the town by electricity at a cost of £1,333.

Port Knockie.—INQUIRY OVER WOODEN POLES.—The refusal of Port Knockie Town Council to consent to the placing of overhead lines on wooden poles throughout the burgh has resulted in the Grampian Electricity Supply Co. asking the Ministry of Transport to hold an inquiry into the matter. The inquiry will be held by Mr. A. A. Erskine on June 28th. At the last meeting of the Town Council, the Provost said that they were determined to see that the lines were carried on steel or iron standards. The Provost and two magistrates were appointed to give evidence at the inquiry.

Portsmouth.—CHOICE OF APPARATUS.—As the result of a decision by the City Council at its last meeting, whenever the installation of lighting, heating and refrigerating plant in premises controlled by the Council is contemplated, the committee responsible must confer with the Electricity Department before making a decision. The resolution was moved by Councillor W. G. Edwards, who said that measures were not always taken to serve the best interests of the community. Recently, when the Piers Committee recommended the installation of gas heaters in the Castle and Lifeboat Cafés Councillor Edwards complained that the committee appeared to have gone out of its way to slight the Electricity Committee.

Stanhope (Co. Durham).—LANEHEAD SUPPLY POSTPONED.—The North-Eastern Electric Supply Co., Ltd., has suggested to the Parish Council that as the probable consumption would not justify the scheme, the proposal to supply electricity to Lanehead should stand over until a more favourable time.

Swindon.—SUPPLY TO FARM.—The Electricity Committee is to make arrangements for provision of a supply to Westlecott Manor Farm.

PROPOSED POWER STATION EXTENSION.—The extension of the generating station at Moredon is being considered.

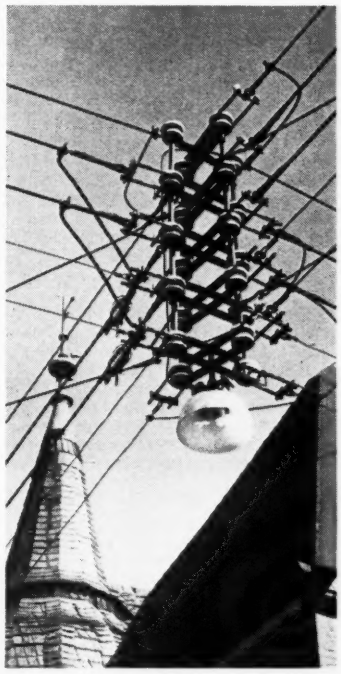
Wolverton (Northants).—STREET LIGHTING.—The Urban District Council has accepted a tender of the Northampton Electric Light Co. for the illumination of streets in the district for the next 15 years. There are to be a total of 566 lamps. Gas lighting has previously been used.

Overseas

Belgium.—ELECTRICITY OUTPUT.—According to *Electricité et Radio*, the output of electric power in Belgium last year was 5,278 million kWh, as compared with 5,549 million kWh in 1937, a decrease of 5 per cent.

Denmark.—POWER SCHEMES.—The power companies of S.W. Jutland have in hand a scheme for the construction of a steam power plant at Esbjerg with a total generator capacity of 30,000 kW. Another large thermal power station is in course of erection near Kyndby, Sealand, where the total capacity will be 60,000 kW. Power will be transmitted at a pressure of 50 kV to sub-stations on the outskirts of Copenhagen. The total costs are estimated at about £850,000.

INTERESTING OVERHEAD DISTRIBUTION SYSTEM.—To reduce the number of poles, overhead line units of the type illustrated are used in many towns in Denmark. In one instance the span across a large square is over 900 ft., this distance being crossed with all the lighting equipment attached to a single network of wires supported only by the buildings on each side.



Overhead line construction in Denmark

France.—MILITARY POWER LINES.—The action of the Government in granting concessions for the construction of power lines for military purposes is criticised on the grounds that normal development of the civil network will be hindered by the application of part of the fund created some years ago for the development of the electrical production and transmission system to the construction of the military lines. Electrical producers point out that the military lines will in many cases duplicate lines required for the civilian population. If power companies were allowed to carry out the work it would be possible to effect very considerable savings in construction costs and advantage could be taken of the security offered by the interconnection of the civil network.

DISTRIBUTION IN PARIS.—The report of the Compagnie Parisienne de Distribution d'Electricité for 1938 indicates that there has been a small but general improvement. Consumption increased by 1.7 per cent. to 864.7 million kWh, a result which is considered particularly satisfactory since the 1937 consumption was exceptional owing to the International Exhibition. The number of consumers increased from 1,113,400 in 1937 to 1,130,609 in 1938, and the connected load rose from 1,486,677 kW to 1,539,715 kW, mainly due to an increase in the number of domestic appliances in service. Every effort has been made to encourage domestic development, with excellent results. Electric cooking appliances connected to the system, for example, have increased from 42,000 to 50,000, while water heaters advanced from 20,700 to 25,500. The report indicates that new constructions and extensions of the network have had to be limited to strictly necessary work, as costs have increased much more rapidly than profits. Arrangements have now been made, however, to permit a larger volume of new work to be carried out each year.

Norway.—POWER EXPORTS.—The Norwegian waterfalls authorities are discussing a scheme to export power on a large scale from the Valdres Rapids to Sweden, where a number of large industrial enterprises are reported to support the plan. It is anticipated that Swedish capital will be available to permit of the construction of a 100,000 HP hydro-electric station near the Abjora Falls in Aurdal. From this new station the entire output is to be conveyed by overland transmission lines to the nearest Swedish sub-station, a distance of approximately 250 miles.

Palestine.—ELECTRICITY AT ROSH PINAH.—Electricity has been installed in Rosh Pinah, one of the oldest Jewish colonies in Palestine, situated in the grape-growing region.

Rumania.—ELECTRICAL PRODUCTION.—Electricity production in 1938 is given as 443.2 million kWh, against 422.9 million kWh in 1937, an improvement of nearly 5 per cent.

Turkey.—ITALIAN INTERESTS SOLD.—The Angora correspondent of the *Daily Telegraph* reports that Italian-owned electric power and light enterprises will be transferred to the Turkish Government on July 1st, following the signature of a re-purchase contract between the Minister of Public Works and representatives of the Italian concerns. A sum of £300,000 is involved, which will be repaid in Turkish products, 50 per cent. immediately and the balance in five annual instalments.

TRACTION

London.—STATION RECONSTRUCTION.—During the last three years extensive reconstruction has been in progress at the King's Cross "Underground" station, the total cost of which will be about £260,000. The first part consists of a new joint ticket hall for the Piccadilly and Northern lines, which was opened last Sunday. Two new banks of escalators have been provided. The existing separate tube stations are being abandoned. The merging of the two stations is the firt part of a programme which will be completed in August of next year. The second stage is a new Metropolitan Line station under Euston Road, where there will be a reversing bay, and when it is ready most of the Metropolitan trains, which are now reversed at Baker Street, will run to the City in peak hours and to King's Cross in other periods.

Manchester.—SURPLUS FROM TROLLEY-BUSES.—The revenue account of the Transport Department for the past year shows that there was a net surplus of £5,857 on the trolley-buses, which earned a revenue of £135,155 in the first complete year of working. On the motor-buses there was a surplus of £101,114, with a revenue of £1,579,543, and on the trams a deficit of £94,140, the revenue being £767,724. After deducting £50,415 sundry charges on appropriation account in respect of converted routes there was a final net deficit of £37,585 compared with a surplus of £77,212 in the previous year. Expenditure was increased to the extent of £81,636 by wage awards, and the financial position was also affected by accelerating the depreciation periods of motor-buses and trolley-buses to six-and-a-half and eight years respectively. It is considered that when the tramways system has been abandoned the results will improve.

FURTHER CONVERSIONS.—Additional tram routes have recently been replaced by buses, and only two now remain on the north side of Manchester. In connection with these, the possibility of an extension of the trolley-bus system is being discussed.

Norway.—TROLLEY-BUSES FOR BERGEN.—The Bergen Municipality has decided to discontinue two tram services and replace them by trolley-buses. It is proposed to place orders for a new fleet of 60-passenger trolley-bus chassis which will be equipped with Norwegian-built Duralumin bodies. The chassis of the vehicles will probably be ordered in England or Sweden.

COMMUNICATIONS

Finland.—RAILWAY RADIO.—The National Union Railway Employees recently opened a campaign with the aim of providing complete radio transmitting and receiving equipment for all important railway stations. Primarily designed as an emergency measure in the event of Finland being involved in war, this railway radio system would also be extremely useful in times of peace, as damage to railway signalling and communicating wires by severe storms is fairly extensive during the autumn and winter.

India.—AUTOMATIC TELEPHONES IN HYDERABAD.—An automatic telephone system has been inaugurated in Hyderabad State. The installation was carried out by a German firm and has cost Rs.500,000. It consists of a main exchange in Hyderabad City with satellite exchanges at Sikundrabad, Adikmet (Osmania University) and Golcunda, with provision, for the present, for 2,500 telephones.

Russia.—MOSCOW-KHABAROVSK TELEGRAPH-TELEPHONE LINE.—Experimental working of the new telegraph-telephone line between Moscow and Khabarovsk was begun on May 29th, when the Assistant Commissar of Communications, Mr. Yartsev, spoke to Khabarovsk. The line, which connects Moscow with the Far East, is 5,415 miles long and passes through eighteen republics, territories and provinces, many of which will be in direct telephone communication with Moscow for the first time. The builders of the line put up 174,000 telegraph poles on which they strung about 22,000 miles of copper wire.

United States.—INVESTIGATION INTO TELEPHONE INDUSTRY.—A *Reuter* message from New York states that the Federal Communications Commission, in its long-awaited report to Congress on its investigation into the American Telephone and Telegraph Co., asks Congress for additional control over the industry. The Federal Communications Commission declared itself ready to inaugurate and develop a broad programme to regulate the telephone industry in co-operation with the States and asked Congress for amendments in the existing laws with a view to extending Federal jurisdiction over the Bell System finances and other matters where authority is lacking. It also proposes to regulate the use of patent licences and acquisitions of control and to fix basic costs. Congressional action on the recommendations is thought to be unlikely this year.

Post Office Relay Scheme

Statement by the P.M.G.

DURING the consideration of the Post Office Estimates on June 16th a debate took place on wire broadcasting. Major Tryon, the Postmaster-General, said that although it was intended that wireless broadcasting should go on in time of war, the wireless broadcasting system would be liable to deterioration or occasional interruption as a result of interference from various sources, from which a wire service would be immune. Therefore, the Government desired to develop wire broadcasting to the maximum possible extent.

The relay companies' licences would be extended for a further ten years from January 1st next, subject to certain modifications with regard to the programme supplied to subscribers and the control of exchanges in times of emergency. Licences granted to new companies would also be terminable on December 31st, 1949, and would be subject to similar conditions. The new licences would require that all services would have to offer a choice between at least two programmes, one of which would have to be a B.B.C. programme. Outside those limits, the companies would be free to give what programmes, including foreign programmes, they liked, subject to the continuance of certain safeguards.

The new licences would contain a provision enabling the Postmaster-General to require a relay company to lease wires at a suitable rental for the purpose of obtaining programmes from a B.B.C. studio entirely by wire. That would permit communication direct to the subscriber and would be of great value from the point of view of defence. So far as control in time of emergency was concerned, the new licence would provide that the Postmaster-General might require the working of the exchange to be continued under his direction or subject to his instructions. Provision would also be made enabling the Postmaster-General to require the relay exchanges in time of emergency to transmit any special announcements ordered by the local A.R.P. service, the national services or the police authorities. That was done during the crisis last September.

A supplementary estimate would be required for the proposed Post Office broadcasting telephone service. The reception coming straight into the home by wire by the new service would undoubtedly be very good. It would be free from interference, which was very bad in certain districts, particularly in some parts of London and in places where there were electrical works. The subscriber would be able to use his ordinary receiving set, which could be adjusted and attached to his telephone. The radio trade was prepared to supply and manufacture receiving sets of special design which would enable the best use to be made of the telephone broadcasting service. On the assumption that the arrangements would prove satisfactory he proposed to start the service on the basis that all sets used by subscribers would be supplied and maintained through the usual trade channels. The cost to the subscriber would be less than 1s. per week. That did not include the receiving set, which, in most cases, the subscriber would already possess; nor did it include the cost of the licence. The average general charge made by the relay companies was 1s. 6d. per week.

He hoped about the end of this year to make a start with a Post Office telephone broadcasting service involving the Central London area and practically the whole of Edinburgh, Birmingham and Manchester.

On behalf of the Labour Party, Mr. Lees-Smith urged that there should be a unified service for the whole system, and objected to handing over "national assets to private profit-making companies." He noticed that the shares of a company called Broadcast Relay Services, Ltd., were quoted at 7s. 6d. on the day that the Postmaster-General made his statement, and the day after they had gone up to 10s.

Mr. Wakefield said that Mr. Lees-Smith did not tell the House that three or four years ago the shares of this company were standing at somewhere about 12s., and, on an announcement being made in the House of Commons, they dropped to something like 5s.

Loan Sanctions Issued

DURING the four weeks ended June 17th the Electricity Commissioners sanctioned the borrowing by public authorities (joint electricity authorities, joint electricity boards and local authorities) for electricity supply purposes of a total sum of £2,274,258, made up as follows:—Purchase of property (including £1,718 for showroom site), £6,285; generating station buildings, £111,118; buildings for distribution, £34,047; generating plant, £1,130,982; distribution plant, £212,355; mains extensions, house services, meters and instruments, £546,278; and consumers' wiring installations, electrical apparatus, &c., £233,193. The following individual sanctions are included:—£500,000 to the Swansea Corporation for plant and building extensions at the Tir John generating station and £280,521 to the Halifax Corporation for plant and building extensions at the power station.

The total amount sanctioned during the period April 1st to June 17th was £4,528,406, which compares with £4,673,441 for the corresponding period of 1938.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

13941. "Control circuits for vapour arc convertors." General Electric Co., Ltd., and W. G. Thompson. August 19th, 1937. (506255.)

22942. "Electric secondary batteries." L. Fuller and E. W. Sudlow. August 21st, 1937. (506062.)

25484. "Railway signalling systems." Siemens & General Electric Railway Signal Co., Ltd., and J. E. Mott. September 20th, 1937. (506162.)

25795. "Electro-deposition of nickel." H. R. Priston and G. E. Gardam. September 23rd, 1937. (506332.)

28623. "Sources of light comprising an electric discharge device and luminescent material adapted to be excited by the discharge therein." General Electric Co., Ltd., A. H. McKeag and J. T. Randall. October 20th, 1937. (506165.)

30824. "Method of applying carbon layers in television tubes." W. W. Triggs (J. D. Riedel-E de Haen Akt. Ges.) September 30th, 1938. (Convention date not granted.) (506072.)

31511. "Three-phase transformers and three-phase choking coils." Siemens-Schuckertwerke Akt. Ges. January 18th, 1937. (506073.)

31660. "Alternating-current voltage regulators." J. B. Hansell and Metropolitan-Vickers Electrical Co., Ltd., November 17th, 1937. (Cognate application 31279/38.) (506336.)

31744. "Electro-mechanical lock for the landing gates and doors of lift systems and the like." Express Lift Co., Ltd., and J. Eriksen. November 18th, 1937. (506380.)

32035. "Electrical condensers." W. H. Moss. November 20th, 1937. (506381.)

32142. "Voice-conveyors for telephones." H. Schober (née Moerder.) February 13th, 1937. (506339.)

32233. "Control of electric winding-engines and the like." British Thomson Houston Co., Ltd., and H. W. C. Liddiard. November 23rd, 1937. (506342.)

32234. "Control of electric winding-engines and the like." British Thomson-Houston Co., Ltd., and T. H. Petch, jun. November 23rd, 1937. (506343.)

32261. "Measurement of electrical resistance." Evershed & Vignoles, Ltd., and C. E. Perry. November 23rd, 1937. (506173.)

32264. "Traffic-control systems." Automatic Telephone & Electric Co., Ltd., and G. W. Thompson. November 23rd, 1937. (506384.)

32277. "Dynamo-electric machines." G. A. Gillen. November 25th, 1936. (506174.)

32287. "Method of providing a moulded insulating structure with an embedded conductor or conductors for use in wiring electrical apparatus and an improved panel therefor." F. J. W. Jansen. November 23rd, 1936. (506268.)

32375. "Small synchronous electric motors." Chamberlain & Hookham, Ltd., and S. James. November 24th, 1937. (506273.)

32347. "Spacers for the electrodes of electron-discharge devices." M-O Valve Co., Ltd., T. F. B. Hall, and H. S. Smith. November 24th, 1937. (506386.)

32351. "Gas-filled electric incandescent lamp." Vereinigte Gluhlampen und Elektrizitäts Akt. Ges. November 24th, 1936. (506274.)

32384. "Cathode-ray tubes." A. H. Rosenthal. November 24th, 1937. (506178.)

32387. "Electrical stress grading devices." Standard Telephones & Cables, Ltd., T. R. Scott, and J. K. Webb. November 24th, 1937. (506277.)

32394. "Cathode-ray indicator tubes." Marconi's Wireless Telegraph Co., Ltd., November 24th, 1936. (506390.)

32416. "Three-phase transformer or choking-coil arrangements." Siemens-Schuckertwerke Akt. Ges. November 24th, 1936. (Cognate application 32417/37.) (506280.)

32492. "Ultra-high frequency electric signal receivers." Marconi's Wireless Telegraph Co., Ltd., November 25th, 1936. (506348.)

32704. "Production of paper, more particularly paper for the insulation of electric cables." Siemens-Schuckertwerke Akt. Ges. November 26th, 1936. (506361.)

34371. "Electric discharge tubes." W. L. W. Schallreuter. December 11th, 1937. (506287.)

35506. "High-frequency electrical signalling systems." C. Lorenz Akt. Ges. December 22nd, 1936. (506289.)

35708. "Elimination of signal weakening in television transmitters." Radio Akt. Ges. D. S. Loewe. December 24th, 1936. (506189.)

1938

556. "Plug-and-socket couplings." A. P. Lundberg & Sons, Ltd., and G. Pegg. January 7th, 1938. (506193.)

702. "Electric switch contacts." Midland Electric Manufacturing Co., Ltd., and A. W. Vicary. January 10th, 1938. (506293.)

1076. "Plug-and-socket couplings." A. P. Lundberg & Sons, Ltd., and G. Pegg. January 12th, 1938. (506294.)

1466. "Jointing of electric cables." J. Beresford & Son, Ltd., and S. A. Smith. January 17th, 1938. (506079.)

1782, "Electrical heat-detector units and methods of making the same." General Motors Corporation. January 27th, 1937. (506196.)

2261. "Multi-stage thermionic valve amplifiers." General Electric Co., Ltd., and L. I. Farren. January 24th, 1938. (506081.)

2506. "Wireless receiving apparatus." General Electric Co, Ltd., and L. C. Stenning. January 26th, 1938. (506082.)

2560. "Electrical measuring apparatus." Ericsson Telephones, Ltd., and E. H. Townsend. January 27th, 1938. (506199.)

4244. "Modulated carrier-wave receivers." Marconi's Wireless Telegraph Co., Ltd. February 10th, 1937. (506085.)

8702. "Electric converting systems." British Thomson-Houston Co., Ltd. March 20th, 1937. (506090.)

10844. "Electric switches having resiliently mounted contacts." A. R. J. Ramsey. (Automatic Control Corporation.) April 8th, 1938. (506218.)

12197. "Mercury switches and relays." Standard Telephones and Cables, Ltd. April 23rd, 1937. (506094.)

12773. "Circuits for modulating high-frequency oscillations." Telefunken Ges. für Drahtlose Telegraphie. May 20th, 1937. (506096.)

15229. "Modulated carrier-wave systems." Marconi's Wireless Telegraph Co., Ltd. March 8th, 1938. (Addition to 472214.) (506306.)

16029. "Thoracoscopes provided with an electrically-heated cauter or diathermy electrode." G. Wolf Ges. June 7th, 1937. (Addition to 502607.) (506226.)

18044. "Electrical systems on aircraft and the like." W. R. Debenham and D. P. Alexander. June 17th, 1938. (506106.)

19613. "Carrier-wave modulating circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. July 3rd, 1937. (506109.)

21416. "Television receivers." R. J. Berry (C. Lorenz Akt.-Ges.) July 19th, 1938. (506112.)

21940. "Radio receiving apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 26th, 1937. (506113.)

22190. "Television transmitting apparatus for generating television signals." Hazeltine Corporation. August 30th, 1937. (506237.)

23403. "Gas or vapour-filled electric-discharge devices." Patentvewertungs-Ges. Hermes. August 7th, 1937. (506122.)

23404. "Gas or vapour-filled electric-discharge devices." Patentverwertungs-Ges. Hermes. August 7th, 1937. (506123.)

24041. "Electric selectors for telephone systems.' F. Merk and Telefonbau und Normalzeit. August 15th, 1938. (506126.)

24091. "Electric device for detecting loose and injurious metal parts in the oil system of power plants." W. D. Van, Os. July 12th, 1938. (506313.)

24118. "Electric heater for liquids." Ferag Akt.-Ges. and E. A. Wyss. August 16th, 1938. (506314.)

24139. "Gain control of valve amplifying systems." Standard Telephones and Cables, Ltd. September 23rd, 1937. (506128.)

25469. "Electric lamp bulbs." M. A. Hassid, and Hassid, Austin and Co., Ltd. August 31st, 1938. (506132.)

25647. "Reception of radio transmissions." G. De Monge. September 1st, 1938. (506133.)

25926. "Portable electrical welding machines." Briggs Motor Bodies, Ltd., J. E. McIntosh and H. Uren. September 5th, 1938. (506316.)

26161. "Electric induction meters." British Thomson-Houston Co., Ltd. September 9th, 1937. (506370.)

31574. "Flexible insulated electric wires." Celloprene, Ltd., and M. Leon. November 1st, 1938. (506147.)

34063. "Directly heated cathodes for electric discharge devices." British Thomson-Houston Co., Ltd. November 23rd, 1937. (506150.)

36580. "Piezo-electric apparatus." British Thomson-Houston Co., Ltd. December 17th, 1927. (506154.)

New Standard Specifications

A NEW edition of British Standard Specification No. 88, electric fuses up to 800 A and 250 V to earth, includes modifications and additions which have been found to be necessary since the 1937 edition was published. Some ambiguities have been rectified and warning notes have been added, the necessity for which was not foreseen until the Specification had come into general use.

The test conditions have now been specified more closely by the inclusion of power-factors and time-constants; the values specified for these qualities represent the outcome of tests carried out by the Electrical Research Association and independently by various manufacturers.

The publication of Specification B.S. No. 794 for transformers for low-voltage lighting recently has now been followed by the issue of two new Specifications dealing with transformers for use with electrically operated toys (B.S.S. 831) and transformers for bell-ringing purposes (B.S.S. 832). Both deal with the standard ratings and essential requirements regarding construction and performance tests.

The Specifications were prepared as the results of a request from the Wiring Regulations Committee of the I.E.E., due consideration being given to the question of safety. Copies of these Specifications can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

The B.S.I. has also just issued a specification for thermostatically controlled thermal-storage electric water heaters with copper containers from 1½ to 100 gallons capacity (No. 843-1939), in preparing which the recommendations of the Electrical Development Association were taken as a general basis.

The performance tests included in the Specification are very comprehensive, and have been devised to ensure, as far as possible, that water heaters complying with the Specification will give satisfactory performance under all reasonable conditions of use. The British Waterworks Association and the Metropolitan Water Board have co-operated closely in its preparation, and clauses are included which should facilitate the obtaining of the approval of water authorities.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

E. A. & J. Y. Walsh, Ltd.—Private company. Registered June 10th. Capital, £6,000. Objects: To carry on the business of electrical, mechanical and general engineers, manufacturers of and dealers in resistances for all purposes, control gear, convertors, dynamos, motors, armatures, &c. Directors: J. Y. Walsh and Mrs. E. M. Walsh, both of 18, Kempnough Hall Road, Worsley, Lancs. Registered office: Barton Road Works, Worsley, Manchester.

R. J. Kemp & Co., Ltd.—Private company. Registered June 12th. Capital, £5,000. Objects: To acquire the business of an electrical engineer and wireless dealer carried on by R. J. Kemp at 26-8, Ashby Road, Coalville, Leicester. Directors: R. J. Kemp, 28, Ashby Road, Coalville; and J. G. Richardson, "Millsyde," Whatton, Nottingham. Solicitor: G. T. Hirst, Coalville, Leics.

Electrical Engineering Supplies (B'ham), Ltd.—Private company. Registered June 12th. Capital, £500. Objects: To carry on the business of wholesale distributors and factors of and dealers in electrical or mechanical supplies, manufacturers' agents, &c. Subscribers: A. F. Dawes, 20, Summerfield Road, Solihull, Warwickshire; and W. M. Thompson, 82, Oxford Road, Moseley, Birmingham. Secretary: W. M. Thompson. Registered office: 70, Lower Essex Street, Birmingham.

City Radio (Cardiff), Ltd.—Private company. Registered June 14th. Capital, £3,000. Objects: To carry on the business of dealers in wireless goods and accessories of all kinds and electrical goods, &c. Subscribers: G. J. Evans, 79, Maindy Road, Cardiff; and T. A. Powell, Norwood, Manor Way, Whitchurch, near Cardiff. Registered office: 94, Queen Street, Cardiff.

Gates & Pearson, Ltd.—Private company. Registered June 10th. Capital, £1,000. Objects: To acquire the business of electrical engineers carried on by G. B. Gates and H. N. Pearson at 1a, Alice Street, Hove, as B.M.A. and Electrical Equipment Co. Permanent directors: G. B. Gates, 27, Palmeira Mansions, Hove, managing director; and H. N. Pearson, 19, Clifton Hill, Brighton. Solicitors: Plumbridge & Co., 15, Prince Albert Street, Brighton.

Metronic Instrument Co., Ltd.—Private company. Registered June 15th. Capital, £500. Objects: To carry on the business of electrical and mechanical engineers, electricians, general machinists, manufacturers of and dealers in instruments, meters, gauges, indicators, integrators, thermometers, measuring and control apparatus, etc. Permanent directors: A. E. Lester, 91, Fitzroy Avenue, Harborne, Birmingham, and H. A. Hallett, "Mywaye," Pilford Road, Cheltenham. Registered office: Bakers Foundry, Grove Lane, Smethwick, Staffs.

Sam's (North Shields), Ltd.—Private company. Registered June 15th. Capital, £2,500. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless and television sets, accessories and apparatus, electrical fittings, vacuum cleaners, &c. Directors: J. Pearlman, 16, Thornhill Gardens, Sunderland, and three others.

Dorset Industries (Poole), Ltd.—Private company. Registered June 2nd. Capital, £100. Objects: To carry on business as manufacturers of and dealers in refrigerators, ice and insulated boxes, carbonators, &c. Miss P. Wilson, of Shore Cottage, Brandsea Road, Hamworthy, Dorset, is first director. Solicitors: Wyndybank & Co., 86-8, Queen Victoria Street, London, E.C.4.

Central Distributors (Southern), Ltd.—Private company. Registered June 2nd. Capital, £3,800. Objects: To carry on the business of distributors of refrigerators of all descriptions, manufacturers of and dealers in hardware, &c. Directors: G. J. Horton, 2, Bristol Gardens, Putney Heath, S.W.15, C. M. Marks, "Plane Tree," Laleham-on-Thames, Middx., and G. P. Hickman, 27, Greystoke Court, Hanger Lane, W.1. Registered office: 221, London Road, North End, Portsmouth.

South London Engineering Co., Ltd.—Private company. Registered June 16th. Capital, £1,100. Objects: To carry on the business of manufacturers, erectors and repairers of and dealers in mechanical, electrical, hydraulic, pneumatic, scientific, automatic and motor machines and machinery of all kinds, &c. The directors are: J. P. Spencer, 16, Effingham House, Albion Avenue, S.W.8, and J. K. Lawrence, Mansers, Nizels Lane, Hildenborough, Kent. Registered office: 43, Clapham Crescent, S.W.4.

British Air Conditioners, Ltd.—Private company. Registered June 16th. Capital, £1,500. Objects: To carry on the business of manufacturers of and dealers in air-conditioning units, ventilators, ventilating fans, air purifiers, central heating, electrical, gas or other heating appliances, &c. W. Glass, "Pentlands," St. George's Hill, Weybridge, is permanent director and chairman. Secretary: W. I. Glass. Registered office: 1, Albemarle Street, W.1.

A. Huxford, Ltd.—Private company. Registered June 15th. Capital, £400. Objects: To manufacture, let out on hire, and deal in wireless apparatus, &c. The subscribers are: F. Huxford and A. Huxford, both of 43, Carr Lane, Grimsby. Secretary: F. Huxford. Registered office: 448, Cleethorpes Road, Grimsby.

Companies' Returns

Statements of Capital

Cornwall Power Co., Ltd.—Capital, £400,000 in 250,000 ordinary and 150,000 preference shares of £1. Return dated May 5th. All shares taken up. £190,007 paid on 40,007 ordinary and 150,000 preference shares. £209,993 considered as paid on 209,993 ordinary shares. Mortgages and charges, nil.

Womersley's Electric Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 15th, 1938 (filed March 10th, 1939). 230 shares taken up. £230 paid. Mortgages and charges, nil.

Weston Electric Lamp Co. (1933), Ltd.—Capital, £200 in £1 shares. Return dated April 5th, 1938 (filed March 25th, 1939). All shares taken up. £200 paid. Mortgages and charges, £550.

Acme Electric Lamp Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 13th. All shares taken up. £2 paid. £993 considered as paid. Mortgages and charges, nil.

Erdington Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated March 31st, 1938 (filed March 30th, 1939). 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Sheffield Electric Power Co., Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1938 (filed February 21st, 1939). 2 shares taken up. £2 paid. Mortgages and charges, nil.

Central Electrical Engineers Accessories Supply, Ltd.—Capital, £1,000 in £1 shares. Return dated June 6th, 1938 (filed March 4th, 1939). All shares taken up. £690 paid. £310 considered as paid. Mortgages and charges, nil.

Electric Cables, Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1938 (filed March 8th, 1939). 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Mortgages and Charges

Watt and Attwooll, Ltd.—Satisfaction in full on September 9th, 1938, of two deposits of deeds with Barclays Bank, Ltd., dated November 23rd, 1936, and registered December 2nd, 1936. (Notice filed June 8th, 1939.) (According to the register of mortgages, the deposits of deeds registered December 2nd, 1936, originally secured all moneys due to bank.)

Receivers Appointed and Released

Robinson & Hands Electric Co., Ltd.—H. V. L. Heaver, chartered accountant, of 20, Waterloo Street, Birmingham, was appointed receiver on June 9th, 1939, under powers contained in debenture dated October 18th, 1934.

W. A. T. Signs, Ltd.—Robert Wood, of 34, Clements Lane, Lombard Street, E.C.4, ceased to act as receiver on June 5th, 1939.

E. C. and A. Ferguson, Ltd. — C. H. Bryant, of 65-66, Basinghall Street, E.C., ceased to act as receiver and manager on May 30th, 1929.

Increases of Capital

Rediffusion, Ltd.—The nominal capital has been increased by the addition of £40,000, in £1 ordinary shares, beyond the registered capital of £10,000. At June 27th, 1938, Radio & Electrical Development, Ltd., held 9,997 shares out of 10,000 issued. They were also allotted the 40,000 new shares for cash on May 24th, 1939.

S.L.R. Electric, Ltd.—The nominal capital has been increased by the addition of £1,000, in £1 ordinary shares, beyond the registered capital of £3,000.

Heyes & Co., Ltd.—The nominal capital has been increased by the addition of £10,000, in £1 shares, beyond the registered capital of £20,000.

Private Arrangement

H. W. Love, radio dealer, &c., 12, Clinton Place, Seaford, Sussex.—A meeting of the creditors was held recently at the offices of Mr. A. E. Orbell, accountant and auditor, 6-7, Old Steine, Brighton, when the statement of affairs disclosed liabilities of £1,173. The net assets were £422, leaving a deficiency of £731. It was decided that the debtor should execute a deed of assignment to Mr. A. E. Orbell, as trustee, with a committee consisting of the representatives of the three principal trade creditors.

Bankruptcy Proceedings

C. E. Ross and **T. E. Perks** (trading as Ross & Perks), 166, Piccadilly, W., electrical engineers.—These debtors attended at the London Bankruptcy Court on June 13th for public examination before Mr. Registrar Parton. Their statement of affairs showed liabilities of £2,169 and assets estimated to produce £4,460, a surplus of £1,720. Debtors stated that they invented various appliances and during 1937 Perks invented an electrical self-registering dart board. About April, 1937, they both had dealings in stocks and shares which in consequence of a falling market declined in value and they sustained an aggregate loss of £3,129. Judgment was obtained against them and eventually bankruptcy ensued. They did not admit insolvency. The examination was concluded.

A. Elliott, carrying on business under the style of Vacs Domestic Appliances at The Empress Hall, Butterworth Street, Littleborough, and 14a, Hargreaves Street and 148, Trafalgar Street, both Burnley, electrical engineer.—The public examination of this debtor took place at the County Court House, Bankhouse Street, Burnley, recently. His statement of affairs disclosed gross liabilities of £3,404 and a deficiency of £2,626. In April this year debtor made an offer to his creditors of 6s. 8d. in the £, but that was not accepted. He said that all the profit he made at Burnley was absorbed by the Littleborough business, which, he said, had been a "disastrous failure." The examination was closed.

I. A. C. Young and **B. G. Wood,** trading as National Radio Supplies, New Arcade Buildings, Market Place, Burton-on-Trent, Staffs, and lately carrying on

business at that address and Midland Road, Derby. (Separate application of I. A. G. Young.)—This debtor applied for his discharge recently at the Court House, 165, Station Street, Burton-on-Trent. The Official Receiver stated that the receiving order had been made in May, 1934. The liabilities of the partnership business were £986. The discharge was granted subject to six months' suspension.

F. W. Scott, 106, Leeds Road, Outwood, near Wakefield, radio and electrical dealer.—This debtor attended at the Court House, Wood Street, Wakefield, recently for his public examination, which was concluded. His statement of affairs disclosed gross liabilities of £328, of which £326 was expected to rank for dividend, with a deficiency of £197. The debtor ascribed his failure mainly to the European crisis last September.

J. E. Mills, 18, Goodhart Way, West Wickham, Kent, and lately carrying on business at 25a, Hall Road, Peckham Rye, S.E., as F. W. Terry & Co., radio dealer.—At the public examination held on June 15th at the County Court, Croydon, it was reported that the debtor had liabilities of £1,974. The examination was adjourned for closing.

C. S. Harrison, electrician, "Macredel," Ismay Road, Chaddesden, Derby, formerly carrying on business at 68, Derby Road, Stapleford, Notts, as Harrison and Harrison, electrical contractor and radio engineer.—Receiving order made June 10th on debtor's own petition. First meeting June 23rd at 22, Regent Street, Park Row, Nottingham. Public examination July 18th at the Court House, Derby.

W. S. Scott (The West End Radio), radio engineer, 452, West Road, Newcastle-upon-Tyne.—Receiving order made June 13th on debtor's own petition.

G. C. Pinney and **A. E. Miller** (Granby Service Co.), wireless and electrical dealers, 4, Granby Street, Littleport.—First meeting June 23rd at 41, Sidney Street, Cambridge. Public examination July 7th at the Guildhall, Cambridge.

R. H. Watkin (Cornish Radio Exchange), radio dealer, 100, Trelowarren Street, Camborne.—Trustee, Mr. G. C. Hancock, 12, Princes Street, Truro, Official Receiver, released June 7th.

W. T. Dalton, wireless engineer, 62, East Street, Horsham.—First meeting June 23rd at 8, Old Steine, Brighton. Public examination July 28th at the Court House, Brighton.

J. J. Glover, electrical contractor, 24, Market Place, Reading.—Public examination July 6th at the Assize Courts, Reading.

S. Herzberg, electrical dealer, 11, Victoria Dock Road, Canning Town, London.—Application for discharge to be heard on July 6th at Carey Street, London, W.C.2.

L. D. Micklethwaite, radio dealer, 72, King Street, Dukinfield, Chester.—Application for discharge to be heard on July 13th at the Town Hall, Stalybridge.

W. J. Fishbourne, electrical and mechanical engineer, 7, Tynewydd Terrace, Newbridge, Mon.—Last day for receiving proofs for dividend June 28th. Trustee, Mr. R. Betts, 34, Park Place, Cardiff, Official Receiver.

E. B. Clendinnen, wireless dealer, 111, Wolverhampton Road, Stafford.—First dividend of 2s. 6d. in the £, payable at 1, Martin Street, Stafford.

Company Liquidations

W. T. Canning & Co., Ltd., wireless and electrical engineers, 47, Goldhawk Road, London, W.12, and at Greenford Road, Harrow.—The statutory meeting of creditors was held on June 13th at the offices of Sunderland, Mountstephen & Co., C.A., 15, Eastcheap, London, E.C. The statement of affairs showed ranking liabilities of £1,655. The net assets were £1,251, leaving a deficiency, as regarded the creditors, of £404. The issued capital was £2,000, and so far as the shareholders were concerned there was a deficiency of £2,404, which was attributed to losses on trading and depreciation written off the assets in the statement of affairs. It was unanimously decided that the voluntary liquidation of the company should be continued with Mr. R. Mountstephen as liquidator, with a committee.

Great Eastern Electric Co., Ltd., 73, Houndsditch, E.C.—The first meetings of creditors and shareholders under the compulsory liquidation of this company were held on June 8th at Bankruptcy Buildings, Carey Street, W.C. Mr. H. P. Naunton, Official Receiver, reported that the company was incorporated in 1925 as the Great Eastern Factoring Co., Ltd., the present title being adopted in 1931. In December, 1933, the company purchased for £9,700 the business of Brahams (Houndsditch), Ltd. After the acquisition of that business it carried on operations as wholesale dealers in wireless and electrical goods, Brahams (Houndsditch), Ltd., then ceasing to trade. The managing director, Mr. John Braham, who had changed his name by deed poll from John Levinson, had stated that in 1937 wireless manufacturers changed their policy and supplied sets direct to retailers. The company subsequently was unable to obtain wholesale discounts, and its supplies were stopped, with the result that the turnover declined heavily. In March, 1938, a declaration of solvency was sworn by Mr. Braham and Mrs. B. Braham, and at an extraordinary general meeting a resolution was passed for voluntary liquidation with Mr. P. A. Houstoun as voluntary liquidator. A statement of affairs presented at that time showed liabilities of £12,638 and assets £13,619, but the accounts filed under this liquidation showed liabilities £4,678 against assets £1,938. These liabilities included £3,124, the balance due to creditors who had received a dividend of 10s. in the £. The failure of the company was attributed by Mr. Braham to decline in turnover, consequent upon the wireless manufacturers' policy of supplying goods direct to retailers. Mr. F. E. Bendall was appointed liquidator with a committee of inspection.

Heala, Ltd., Southend Road, Beckenham, electrical engineers and contractors.—The first meetings of creditors and shareholders under the compulsory liquidation of this company were held on June 15th at Bankruptcy Buildings, Carey Street, W.C. Mr. E. T. Sanders, Assistant Official Receiver, reported that the company was formed in October, 1935, to acquire from Mr. Wm. Thomas Russell the business of manufacturers and dealers in the Heala ray apparatus, Heala lamps and Heala "Vitalux" bulbs. The statement of affairs showed liabilities of £5,200, of which £4,916 was expected to rank for dividend; assets of £896, after allowing £280 for payment of preferential claims; and an issued capital of £4,475. The failure of the company was attributed to lack of sufficient finance to cope with rapidly expanding market, to heavy overhead expenses and to dissension between the directors, which seriously hampered the company's progress. A resolution was passed for Mr. P. E. Slack (who had been acting as special manager) to fill the post of liquidator, assisted by a committee of inspection.

Walls Radio, Ltd.—Meeting July 19th at 1, Westover Mansions, 13, Gervis Place, Bournemouth, to receive an account of the winding up by the liquidator, Mr. A. W. Miles.

Reports and Dividends

The Electric Construction Co., Ltd., held its annual meeting on June 16th, when Mr. J. Gray (chairman and managing director) said that the net profit for the year exceeded that of any previous period. This result was obtained notwithstanding an appreciable recession in the volume of orders received during the year, but an unusual volume of unexecuted orders from the previous year was available and full production was thus maintained in most departments. The additions to the workshops (and some minor rearrangements) made in recent times at comparatively small cost had enabled prompt delivery to be made.

It was impossible to enumerate contracts in detail, but with the exception of large turbo-alternators, these included every class of electrical equipment for lighting and power installations, for rolling mills, also for mining and industrial purposes generally. Demands for traction, radio and cinema purposes also expanded. Although export prices were not attractive they continued, as a matter of policy, to extend their connections. In consequence of the continued unsettled political conditions it was impossible to make with any degree of accuracy a forecast of the future. Orders received since April 1st, however, were very encouraging, and given a continuation, they could view the future with every confidence.

Telephone Rentals, Ltd.—Presiding at the annual meeting, held on June 19th, Mr. F. T. Jackson (chairman) said that once again they were in a position to report that all their subsidiaries, with one exception, had traded at a profit. Trade in general was on the down grade when they held their last annual meeting. Now it was definitely on the up grade once more, and the result achieved was better than was anticipated a year ago. So far as the prospects of their English subsidiaries were concerned for the year 1939, the position was favourable on the basis of the business done during the first five months of this year. Their Australian associated company earned a substantial profit for the year ended December 31st, and so far as could be judged from the first five months of 1939 in Australia, they were well on the way to another successful year there.

Pye, Ltd.—The annual meeting was held on June 16th when Sir Thomas A. Polson (chairman), in moving the adoption of the report and accounts, said that the year had been one of extreme difficulty for the radio industry. How well they had withstood the test was evidenced by the fact that the net profits were only £10,000 less than the average profits of £84,000 for the ten years of the company's existence, and they had been able to maintain their dividends.

Mr. C. O. Stanley (managing director), in seconding the resolution, mentioned that the industry was rapidly reaching a state of stabilisation which should help the future of their business. In addition, there were now such large numbers of radio receivers of indifferent character in use that there should be a big replacement market in front of them. With regard to television, the market had expanded enormously and the rate of expansion in the future should now go up by leaps and bounds.

The British Electric Traction Co., Ltd.—Presiding at the annual meeting held on June 16th Mr. J. S. Austen (chairman), said that the shareholder who originally held £100 of deferred stock and had kept every bonus that had been declared now had £570 of stock, which was worth about £5,700 and he was getting a cash dividend equivalent to 28 per cent. on his original £100 holding. Mr. Austen referred to the efficiency of their organisation and criticised the establishment of combines, maintaining that huge concerns did not result in efficiency or economy.

The Electrical Finance and Securities Co., Ltd.—Presiding at the annual meeting on June 15th Mr. G. H. Nisbett (chairman) said that their subsidiary companies operating in the neighbourhood of London were rather badly hit by the effect of the cold weather last December. They had in those areas a large radiator load and their maximum load was increased far beyond the normal, and they had, therefore, to pay exceptional sums on maximum demand account to the authorities from whom they bought their bulk supplies. The profits of those companies where electricity was sold to two-part tariff consumers at low rates per kWh had been seriously affected on account of the cost of the bulk supply due to the increased cost of coal, and it had been necessary in two companies to increase the "unit" rate. On the other hand, their subsidiaries, without exception, continued to make good progress, the additions to their mains during the year representing an increase of 13 per cent. in new consumers and of 17 per cent. in kW connected.

Aeronautical and General Instruments, Ltd.—Presiding at the annual meeting held on June 20th Lt.-Col. Sir Louis Vaughan said that in October they acquired the goodwill of Gambrell Bros. & Co., Ltd., scientific instrument makers, together with the greater part of their plant, machinery and equipment, and later their freehold factory at Wimbledon. This acquisition had provided them with numerous advantages and had enabled them to expedite their production and to increase their turnover. In addition, they had also acquired the optical instrument manufacturing business of Hall Bros. The acquisition of these two concerns would enable them to make still further progress during the coming year and to extend the range of their products in many directions. The contracts in hand were larger than ever before and would keep their works fully employed well beyond the current year.

West Kent Electric Co., Ltd.—The subscription list was opened on Tuesday last for an issue of 500,000 4½ per cent. cumulative preference shares of £1 each at 20s. 6d. per share. The company, which is associated with the County of London Electric Supply Co., Ltd., was incorporated in 1908 and is one of the comparatively few companies holding statutory powers in perpetuity. The authorised area for the supply of electricity for all purposes covers 138 sq. miles in Kent, where a distribution system already comprising 810 miles of mains and 99 transforming stations serves twenty urban and rural communities, including Orpington, Crayford, Petts Wood, Hayes, West Wickham and Swanley, giving direct supplies to 35,700 consumers. In addition, supply for power purposes is given to a number of manufacturing concerns, and in bulk to the boroughs of Beckenham, Bromley and Dartford, and the Foots Cray and Sevenoaks Companies. The present issue is being made partly for the purpose of repaying temporary borrowing, amounting to £110,000, but mainly to provide funds for the further general development of the undertaking.

The lists were closed the same morning, being oversubscribed.

James Howden & Co., Ltd.—The list was to open and close yesterday (Thursday) for an offer for sale by the Montrose Trust of 150,000 ordinary shares of 10s. each at 16s. 6d. per share. The capital of the company has recently been reorganised and now consists of 700,000 ordinary shares of 10s. each authorised, of which 476,000 are issued. Of these the Montrose Trust has subscribed 50,000 and bought another 100,000 from three of the directors, who will continue to hold the majority of the shares.

Davis & Timmins, Ltd., are raising further capital by an issue of 20,000 5s. ordinary shares which are being offered to ordinary shareholders at 15s. per share in the proportion of one new share for every seventeen held.

The General Electric Co., Ltd., reports a record profit of £1,776,099 for the year ended March 31st, as compared with £1,772,181 for 1937-38, to which is added £799,934, making £2,576,033. From this the following deductions are made: Depreciation, £380,492; directors' remuneration, £4,800; contribution to pension fund, £62,057; preference dividends, £182,700; taxation reserve, £430,000; general reserve, £100,000. It is again proposed to pay a dividend of 10 per cent., less tax, for the year on the ordinary stock, and a bonus of 10 per cent., less tax, leaving £807,220 to be carried forward. The report states that the company's works have been fully employed. The inflow of orders, whilst not reaching the peak of the previous year, has been on a satisfactory level, but higher production costs due to wage increases are tending to make business more difficult, both at home and in overseas markets. The company has continued to co-operate, both in research and production, with the Government's rearmament programme. The volume of overseas business has again increased and established a new record. The branch companies have had a successful year's trading, with the exception of China, where conditions have continued to be adverse. The recent restrictions imposed on imports into New Zealand are seriously endangering the satisfactory business built up there in recent years. The tendency of overseas markets to manufacture their own requirements is forcing the company to consider the establishment of factories in some territories. The number of the company's employees at March 31st was 39,530, a slight increase over the previous year. Further expansion is shown by the contributory pension fund, the membership having reached a total of 9,267. The assets held by its trustees amount to £1,804,000. Meeting: June 29th.

The Bagdad Light & Power Co., Ltd., reports a net profit for 1938 of £26,943, as compared with £24,986 for 1937. A dividend of 4½ per cent., free of tax, is to be paid on the ordinary shares (against 3½ per cent., tax free), and £7,335 is carried forward (against £6,890 brought in).

The La Plata Electric Tramways Co. reports net receipts in sterling of £6,247 for 1938, as compared with £7,294 for the preceding year, plus interest, &c., £50. After deducting interest on debenture stock accrued but not paid, debenture redemption fund accrued but not applied, and difference in exchange, the loss for the year is £3,630 (against £1,391). The credit brought in is £15,074, and after appropriating £3,630 to renewals reserve the balance carried forward is £7,814.

With regard to the dispute with La Nacional, the board reports that the Appeal Court recently gave a final decision revoking a previous judgment and that the combined effect of the Court's decisions is that the company is ordered to complete the sale to La Nacional notwithstanding the withholding by the municipality of its consent, while the damages and costs up to date awarded to La Nacional after deduction of counterclaims of the company will, it is estimated, result in a balance in favour of La Nacional approaching $900,000 pesos. The board is advised that there is no appeal against this decision. As the company has no funds available towards meeting this balance and moreover is in default in the service of its debenture stock, it appears to the board that there is no alternative but to endeavour to arrange as soon as possible to carry out the original sale agreement which has been ordered to be effected by the Court.

The Globe Telegraph & Trust Co., Ltd., reports a net revenue for the year to May 31st of £258,331, as compared with £264,747 for 1937-38. Reserve receives £20,000, and the final ordinary dividend is 3¾ per cent., making 7½ per cent. for the year, tax free (same), plus a special bonus of 2½ per cent. (same). This bonus will be paid from the proceeds of the sale of 4 per cent. funded income stock issued by Cable & Wireless (Holding), Ltd., in satisfaction of arrears of preference dividend. The balance carried forward is £117,992 (against £134,454 brought in).

Ward & Goldstone, Ltd., report a net profit for the year ended March 31st of £73,721, as compared with £74,545 for 1937-38. It is proposed to pay a final dividend on the ordinary shares of 15 per cent., making 20 per cent. for the year (same). In addition, a bonus of one new 5s. ordinary share for every ten shares held is to be distributed. General reserve receives £10,000, A.R.P. reserve £5,000 and £16,572 is carried forward (against £16,925 brought in).

The Paignton Electric Light & Power Co., Ltd., reports a net revenue for 1938, after providing for depreciation and income tax, of £14,588. After deducting the interim dividend and adding £3,881 brought in, there is a balance of £14,469. The final dividend is 6 per cent., making 10 per cent. for the year, general reserve receives £4,579, and £3,890 is carried forward. During the year £7,500 from reserve, and £2,500 from the undistributed balance on net revenue account, was capitalised, and a bonus issue of 10,000 shares was made to shareholders in the proportion of one share for every nine held.

Aron Electricity Meter, Ltd., announces a net profit of £28,531 for the past year, as compared with £22,062 in the previous year. Reserve receives £22,416, and the final dividend is 10 per cent., less tax, making 15 per cent. for the year (same). The balance carried forward is £14,719 (against £25,127 brought in).

Thomas De La Rue & Co., Ltd., report net profits for the year ended April 1st of £248,355, as compared with £185,452 for 1937-38. The distribution on the increased share capital is raised from 12 per cent. to 26 per cent., taxation reserve receives £90,000. general reserve £50,000, and plant obsolescence £10,000. The balance carried forward is £18,904 (against £16,769 brought in).

The Mid-Wales Electric Power Co., Ltd., reports a net profit for 1938 of £29, as compared with £10 for the preceding year, increasing the credit balance carried forward to £148.

Greenwood & Batley, Ltd., have declared a final ordinary dividend of 12 per cent., making 15 per cent. for the year. In 1937-38, there was an interim dividend of 3 per cent., a final dividend of 7 per cent. and a bonus of 5 per cent. The profit for 1938-39 was £105,467, an increase of £1,105.

Taylor Tunnicliff (Electrical Industries), Ltd., has declared a maiden interim dividend on the ordinary shares of 2½ per cent., actual, less tax, in respect of the initial period to December 31st next. The company was registered in November last.

The International Combustion Co., Ltd., has declared an interim dividend of 7½ per cent. (same).

The Victoria Falls and Transvaal Power Co., Ltd., has declared a final ordinary dividend of 11 per cent., making 15 per cent. for 1938. This compares with 13½ per cent. for 1937.

Chadburn's (Ship) Telegraph Co., Ltd., is paying a first and final dividend of 6 per cent. (same), plus a bonus of 6½ per cent. (against 4 per cent.), less tax.

Exterior of the new Mansfield showrooms and a view of the main apartment **(See page 922)**

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets have drifted into a condition of such sensitiveness that the circulation of any rumour or report serves to bring about fluctuations in prices which are wholly disproportionate to the volume of business that causes them. Dullness developed, as a result of disappointment felt with the delay over the anticipated Russian Pact. In addition to this, the aggressive attitude adopted by Japan, brought about a heaviness over most parts of the House.

The effect of the uncertainties now overhanging the markets as a whole is seen in a contraction of business in stocks and shares of all kinds. Company reports now appearing are, in the main, satisfactory, though an occasional exception makes its appearance

An increasing impression that Japan is unlikely to push her aggressive policy to anything like extreme lengths, served to rally gilt-edged prices. Following the Consol market, a firmer disposition spread round other parts of the House. But business remained very quiet.

G.E.C. Dividend

The General Electric distribution for 1938-9 was up to, and the profits rather beyond, expectations. As before, the dividend of 10 per cent. is supplemented by a cash bonus of like amount. Trading profits are slightly higher at £1,776,100, and the net figure only £16,500 down at £1,328,750. Most people had been prepared to see more of a reduction in the net earnings for 1937-8, that year having been described by the chairman as exceptional. There is particular satisfaction, therefore, that the company has been able to maintain the payment without cutting into the customarily generous provision for reserves. These reserves now amount to £4,600,000 —a sum greater than the issued amount of ordinary stock. The defence programme has evidently had some say in the results, and the impression is confirmed that the company has been responsible for a very fair share of the good electrical export returns. The shares are quoted ex-dividend at 75s. 6d., the yield being 5.3 per cent.

Publication of the White Paper containing details of the Government's excess profits proposals, had a slightly depressing effect upon the shares of companies likely to come within the scope of the new clause in the Finance Act. A drop of 9d. in Vickers shares, to 18s. 9d., is due to this cause.

Electrical Equipment

A report that plans have been authorised for the construction of a number of new generating stations for the C.E.B. has met with no response in the market for electrical equipment shares. Where prices have changed at all the movement has been downwards. Thus British Insulated at 4 and Callender's at 65s. are 2s. 6d. and 3s. 9d. down respectively, while Crompton Parkinsons at 18s. 9d., Siemens at 23s. 9d., and Johnson & Phillips at 40s., are all 1s. 3d. lower on the week. Yet the news constitutes, it would seem, a satisfactory bull point. Calculations on the basis that the cost of construction is about £21 per kilowatt of generating plant, of which about half is spent on electrical machinery, indicate many million pounds' worth of new orders for the industry. From all accounts, it is true, the latter is occupied well enough for the time being. The scheme for a wartime reserve of equipment is said in itself to be providing a great amount of work. But the new Central Electricity Board schemes are to extend over a number of years, and to be capable of further expansion. Many people are asking how industry in general will stand when Government work is allowed eventually to slacken. The electrical equipment manufacturers appear to have their own answer ready.

Radio by Telephone

It seems that the radio manufacturers and the broadcast relay services have little to fear from the Postmaster-General's new plan for a telephone broadcasting system. At first sight, the scheme smacked of Government competition in a field developing under private enterprise. Major Tryon, however, was at pains to emphasise his anxiety to see rapid extension of the private services. The system has obvious value in times of danger, and the resources of both the relay companies and the Post Office should be thrown into its development. Moreover, wireless by telephone will need, in conjunction, the use of a wireless set; whereas with the present relay systems a loud speaker is the listener's only necessary equipment. These considerations would seem to set at rest at once the apprehensions of the relay companies and the radio set makers. Some uneasiness appears, nevertheless, to be felt, for E. K. Coles have fallen 1s. 3d. to 18s. 9d., and Pye deferred 1s. to 9s. 6d. The 5s. shares of Broadcast Relay Services are firm, and comparatively active, around 10s. 3d.

B.E.T. Meeting

It is given to few stockholders to hear their chairman discuss the market value of their investments. Mr. J. S. Austen, at the annual meeting of British Electric Traction, talked on this subject because some holders have to sell the bonus shares distributed regularly each year. If that policy were dropped, said Mr. Austen, in favour of the more usual cash distribution, there would be sufficient income available to pay practically 6 per cent. on the £1,000 which is about the cost of £100 deferred stock. On former occasions he had declared the price of the stock to be well represented by the value of the assets. This time, he found justification for the price of the stock on the grounds of income. Those who have been able to keep their bonus shares were told that the original holder of £100 stock now has £570 of stock worth ten times that amount, and is receiving interest equal to about 28 per cent. on his original holding.

The price of the deferred stock is 850, ex bonus. A fair amount of business is being done in the £1 units of the new stock. The price is 8½; equivalent, that is, to £85 for £10 stock.

London Transport

Mainly because of its size, the London Passenger Transport Board was dubbed a failure at the annual meeting of the B.E.T. company. The contention was grounded on the fact that the transport companies who sold their services in exchange for the junior stock of the Board have never had the expected rate of dividend; moreover, the public is having to pay higher fares. Everyone, therefore, is rather worse off than before. The management itself was absolved from any charge of incompetence. Mr. Austen has no use for the theory that size and efficiency necessarily go hand in hand in commercial enterprise. The reverse is, in his experience, the case. He extended his reflections to cover the railways, in relation to the "square deal," and to the electricity supply industry, in connection with the prospective Electricity Bill. There has been no change in the price of London Transport "C" stock, at 79½, since the higher fares came into force. The Board's financial year ends this month.

New Issues

A trickle of new issues keeps the capital market from complete stagnation. The electricity supply industry is helping to keep matters moving with issues by West Kent Electric and the B.C. and H. Power Station Co. The former issue took the shape of 4½ per cent. preference shares, 500,000 of which were offered at 20s. 6d. per share. The proceeds are wanted for general development of the undertakings of the company, which supplies an area in North Kent and is under the management of the County of London Electric Company. The yield at the prospectus price of the shares works out at £4 7s. 10d. per cent. By way of comparison it may be noted that Lincolnshire and Central Electric preference shares, which pay the same rate of dividend, cost 21s. 6d., and yield £4 3s. 9d. per cent.

The B.C. and H. Power Station Co. is controlled by the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Company, itself a subsidiary of Edmundsons', and was formed in 1938 to construct one of the "selected" stations under the grid scheme. An amount of £750,000 3½ per cent. first mortgage debenture stock, 1953-63, is being privately placed, and is available in the market—subject to permission to deal—at about 92¾. This gives the buyer a yield of £3 15s. 6d. per cent., or just under 4 per cent. allowing for redemption in 1963. The stock is identical with the £1,650,000 stock issued a year ago at 99.

Reports and Dividends

Electric Construction shares remain firm at 37s. 6d., the price to which they advanced after publication of the report for 1938 and the increase in the distribution from 12½ to 13½ per cent. At the annual meeting the chairman explained the record profits to be due, in part, to the enlargement and reorganisation of the workshops. The resultant ability to complete orders with greater promptitude played a considerable part in ensuring progress in a competitive industry. The yield of nearly 7½ per cent. on the shares is about 2 per cent. higher than on the leaders in the electrical equipment market.

The Aron Electricity Meter Company's dividend and preliminary report are, in themselves, no explanation of why the shares, at 28s. 9d., ex-dividend, should yield close on 10½ per cent. Profits are up on the year, and the 15 per cent. dividend is maintained.

Taylor Tunnicliff announce an interim dividend of 2¼ per cent. on the ordinary shares. The 5¼ per cent. preference shares, issued last December, are quoted at 21s., and the 5s. ordinary shares at 8s., ex-dividend.

Telephone Rentals are firm at 9s. 6d., the yield of under 3½ per cent. reflecting general agreement with the chairman's cheerful review at this week's meeting.

Electricity Overseas

The £1 shares of the Victoria Falls Power Company, which supplies most of the current used in the gold mines of the Rand, have risen to about the highest price of the year since the increase in the dividend from 13½ to 15 per cent. At 70s. ex-dividend the shares yield £4 5s. 9d. per cent. Among other overseas electricity issues, Calcutta Electrics have receded further to 30s. 6d. Selling of the new shares is probably responsible for the decline. Tokyo Electric 6 per cent. bonds, at 48½ ex-dividend, have shed the recent 3 points rise. American "Tel. & Tel." show a 5 points fall, at 170½ ex-dividend, while International Telephones, at 7¼, and Western Unions, at 20¼, also witness the nervous condition of Wall Street. The fresh interest in Anglo-Argentine Tramway issues proved evanescent. After the short-lived revival, the first preference are back to 6s. 3d., and the income debentures to 13. Brazilian Tractions are down to 10.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price June 20	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole ...	68/3	63/9	15	15	65/–	—	4 12 4
British Power & Light ...	30/9	28/–	7	7	28/6	—	4 18 3
City of London	33/9	31/–	7½	7½	32/–	—	4 2 6
Clyde Valley	37/9	34/–	8	8	37/–	–6d.	4 6 6
County of London ...	46/9	41/9	10½	10½	44/–	–6d.	4 15 5
Edmundson's :							
7% Pref....	31/6	30/–	7	7	30/6xd.	—	4 11 10
Ord.	27/9	23/–	9	6	25/9xd.	–6d.	4 13 2
Elec. Dis. Yorkshire ...	41/6	37/9	9	9	38/9	—	4 12 9
Elec. Fin. and Securities ...	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation...	51/9	48/–	12	12	49/–	—	4 18 0
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power ...	34/6	29/–	7½	7½	30/9	–6d.	4 17 7
Llanelly Elec.	22/6	21/–	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric ...	29/3	26/3	7	7	26/3	—	5 6 8
London Electric	34/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red. ..	106½	102½	5	5	104½	+1	4 16 6
Metropolitan	51/–	45/3	12	12	47/6	—	5 1 0
Midland Counties	38/9	34/–	8	8	38/–	–9d.	4 4 3
Mid. Elec. Power	41/9	38/3	8	9	38/9	—	4 13 0
Newcastle Elec.	28/9	26/6	7	7	27/–	—	5 3 8
North Eastern Electric :							
Ordinary...	32/3	28/6	7	7	31/–	—	4 10 4
7% Pref....	32/6	30/–	7	7	31/6	—	4 9 0
Northampton	48/–	45/–	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13½	13	6	6	12¾xd.	—	4 14 1
Northmet Power :							
Ordinary...	46/6	41/6	10	10	44/6	—	4 10 0
6% Pref....	29/–	27/6	6	6	27/6	—	4 7 3
Richmond Elec.	29/–	27/3	7	7	27/6	—	5 1 10
Scottish Power	38/9	33/9	8	8	36/3	—	4 8 2
Southern Areas	22/9	19/6	4½	5	20/6	—	4 17 7
South London	30/9	28/–	7	7	28/–	—	5 0 0
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/–	2	2½	18/6	—	2 14 1
Yorkshire Elec.	38/6	34/9	8	8	37/–	—	4 6 6
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	2/9	—	—
Calcutta Elec.	39/–	31/–	10*	10*	30/6	–6d.	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	7 1 7
East African Power ...	26/3	22/6	7	7	24/–	—	5 16 8
Jerusalem Elec.	24/6	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	28/6	8*	8*	26/3	—	5 6 2
Montreal Power	34½	31	1½	1½	35	—	—
Palestine Elec. "A" ...	29/6	26/3	7½*	7½*	26/3	—	5 14 1
Perak Hydro-electric ...	18/9	15/–	7 ¶	6	15/9	—	7 12 4
Shawinigan Power ...	23½	20	85cts.	83cts.	21½	—	—
Tokyo Elec. 6%	61	50	6	6	48½xd.	–3	12 7 6
Victoria Falls Power ...	72/–	60/–	13½	15	70/–xd.	+¼	4 5 9
Whitehall Investments Pref.	19/6	16/–	7½	7½	19/–	—	7 17 0
Public Boards							
Central Electricity :							
1950–70	112	106	5	5	110	—	4 11 0
1955–75	115½	108	5	5	110	—	4 11 0
1951–73	106½	103½	4½	4½	104½	—	4 6 2
1963–93	95½	86	3½	3½	91½	—	3 16 6
London Elec. Trans. Gtd.	88½	84	2½	2½	86½	—	2 17 6
London & Home Counties,							
1955–75	107½	106½	4½	4½	107	—	4 4 1
Lond. Passenger Transport :							
A	114½	104¾	4½	4½	105½	–3	4 5 4
B	117½	105	5	5	108½	–4	4 12 2
C	83½	64¼	4¼	4	79½	—	5 0 8
West Midlands Joint Elec.,							
1948–68	112½	109	5	5	108½	—	4 12 2
Telegraph and Telephone							
American Tel. & Tel. ...	180	159	9	9	170½	–5	5 5 5
Anglo-Am. Tel. :							
Pref.	101½	89½	6	6	94½	—	6 7 0
Def.	23⅜	19	1½	1½	23	—	6 10 4
Anglo-Portuguese	24/–	19/9	8	8	21/3	—	7 10 7
Cable & Wireless :							
5½% Pref.	95½	75	4½	5½	90½	–3	6 1 7
Ord.	55	34	4	4	51½	–1	7 15 5
Income	100	95½	—	—	98	—	4 1 8
Canadian Marconi $1 ...	5/6	3/9	—	Nil	4/9	—	—
Globe Tel. & Tel. :							
Ord.	31/3	23/6	7½*	7½*	28/9xd.	–¼	5 4 4
Pref.	26/9	23/3	6	6	26/3xd.	+9d.	4 11 5
Great Northern Tel. (£10)...	38	27½	20	20	32½	–½	6 3 0
Inter. Tel. & Tel.	10½	7½	Nil	Nil	7½	–¾	—
Marconi-Marine	30/–	23/–	7½	10	28/9	–¼	6 19 4
Oriental Telephone Ord. ...	2½	46/3	12*	12*	2 7/16	—	4 16 0
Radio Corpn.	8⅞	6	8	6	7	—	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–) ...	10/–	8/6	6	6	9/6	—	3 3 2
Western Union	25½	19½	2¾	—	20½	–2	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	7/6	3/6	Nil	Nil	6/3	–1/16	—
4% Inc.	16	7	Nil	Nil	13	–2	—
British Electric Traction :							
Def. Ord.	1025	700	5	5	850xb.	—	—
Pref. Ord.	164	158	8	8	155	+2	5 3 3
Bristol Trams	48/6	37/3	8	10	47/6	–9d.	4 4 2
Brazil Traction	13	7⅞	$1	50c.	10	–⅜	—
Calcutta Trams	25/6	23/6	8	8	22/–	–1/–	7 5 6
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	36/6	32/6	10	10	32/6	—	6 3 1
Mexican Light :							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	70	—	7 2 10
Southern Rly :							
5% Prefd.	75½	48	5	5	73	—	6 17 4
5% Pref....	99½	80	5	5	95½	–2	5 4 9
T. Tilling	48/3	39/6	10	10	46/3	–9d.	4 6 7
Tilling & B.A.	53/–	50/–	10	9*	52/6	—	3 8 7
West Riding	37/9	31/3	10	10	36/3	–¼	—
Equipment and Manufacturing							
Aron Electricity Ord. ...	32/3	28/9	15	15	28/9xd.	—	10 8 8
Assoc. Elec. :							
Ord.	45/3	34/9	10	10	39/–	—	5 2 7
Pref.	36/6	34/–	8	8	35/–	—	4 11 5
Automatic Telephone & El.	46/6	39/3	10	12½	47/6	—	5 5 3
Babcock & Wilcox ...	42/9	37/–	10	12½	44/6	—	5 12 4
British Aluminium Ord. ...	58/3	48/9	12½	12½	57/6	–9d.	4 7 0
British Insulated Ord. ...	88/–	77/–	20	20	4	–⅛	5 0 0
British Thermostat (5/–) ...	16/–	12/–	18½	18½	13/9	—	6 14 7
British Vacuum Cleaner (5/–)	22/6	18/6	40	40	15/–	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/6	—	—
Callender's	92/–	67/6	20	15	65/–	–3/9	4 14 3
Chloride Elec. Storage ...	82/3	65/–	20	15	3¾	—	4 12 4
Consolidated Signal ...	96/–	80/9	36½	36½	82/6	–¼	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	23/9	—	7 7 4
Crompton Parkinson :							
Ord. (5/–)	21/–	14/9	12½	15	18/9	–1/16	—
E. K. Cole (5/–)	9/–	4/–	10	Nil	5/–	—	—
Elec. & Musical Industries (10/–)	14/9	8/9	10	5	10/3	—	4 17 7
Electric Construction ...	38/6	30/6	12½	13½	37/6	—	7 4 0
Enfield Cable Ord. ...	58/6	2½	25	16½	53/9	—	6 0 10
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/–	30/3	10	10	34/6	–6d.	5 16 1
Ensign Lamps (5/–) ...	14/6	13/9	—	25	14/3	–3d.	8 15 6
Ericsson Tel. (5/–) ...	43/–	35/–	25*	25*	41/3	–¼	3 0 6
Ever Ready (5/–)	24/–	19/3	35	30	19/6	—	7 14 0
Falk Stadelmann	27/–	21/–	10	10	22/6	—	8 18 0
Ferranti Pref.	25/6	23/6	7	7	22/6xd.	—	6 4 5
G.E.C. :							
Pref.	31/9	29/3	6½	6½	31/3	+¼	4 3 2
Ord.	82/–	70/9	17½	20	75/6xd.	—	5 6 0
Greenwood & Batley ...	27/6	24/6	7	15	28/9	+¼	10 8 8
Hall Telephone (10/–) ...	22/3	19/3	15	15	21/3	—	7 1 2
Henley's (5/–)	21/–	17/9	20	20	18/9	—	5 6 8
4½% Pref.	23/–	21/6	4½	4½	22/6	—	4 0 0
Hopkinsons	46/3	37/3	12½	15	43/3	–1/9	6 18 4
India-Rubber Pref. ...	21/–	20/–	5½	5½	21/3	—	5 3 6
Intl. Combustion	120/–	97/–	32½	32½	5⅞	–¼	5 9 5
J. Lucas	60/–	52/–	15	15	57/6	–¼	5 4 4
Johnson & Phillips ...	41/3	32/–	12½	12½	40/–	–¼	6 5 0
Lancashire Dynamo ...	68/–	60/–	25	25	62/6	—	8 0 0
Laurence Scott (5/–) ...	12/–	10/–	15	15	11/–	—	6 16 4
London Elec. Wire ...	31/6	29/–	12	7½	28/9xd.	–6d.	5 4 4
Mather & Platt	50/–	42/6	13½	13½	48/3	–6d.	5 12 0
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	76/3	–¼	5 5 0
Pye Deferred (5/–) ...	13/9	7/6	25	25	9/6	–1/–	13 3 2
Revo (10/–)	35/6	31/–	17½	17½	29/–	—	6 0 8
Reyrolle	61/–	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	23/9	–¼	6 6 4
Strand Elec. (5/–) ...	5/6	4/9	5	10	4/6	–6d.	11 2 0
S. Smith (1/–)	9/9	6/–	37½	50	8/9	—	5 14 3
Switchgear & Cowans (5/–)	15/–	11/3	20	20	12/6	—	8 0 0
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction ...	2½	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–) ...	10/–	8/–	9	9	9/6	—	4 14 9
Tube Investments... ...	91/–	82/9	23½	23½	87/6	–¼	5 9 7
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	19/–	10	10	18/9	–9d.	5 6 7
Westinghouse Brake ...	54/9	43/9	17½	17½	48/9	–½	7 3 5
Walsall Conduits (4/–) ...	31/9	24/–	55	55	27/–	–6d.	8 3 0
West, Allen (5/–)	7/6	5/9	7½	10	6/9	—	7 8 2

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Argentina.—BUENOS AIRES.—July 24th. National Sanitation Works Department. Eleven transformers. (T. 23602/39.)*

Australia.—MELBOURNE.—August 2nd. Victorian Railway Commissioners. Battery charging equipment. (T. 23332/39.)*

Power ringing machines. (T.Y. 23259/1939.)*

July 4th. Postmaster-General's Department. Automatic telephone switching equipment. (T. 23549/39.)*

October 3rd. State Electricity Commission of Victoria. AC network analyser. (See this issue.)

Beckenham. — June 28th. Borough Council. Coal for the electricity generating station. (June 16th.)

Bedford.—July 1st. Electricity Department. Trunk road lighting equipment. (June 16th.)

Bingley.—July 3rd. Electricity Department. One 500-kVA transformer. (June 9th.)

Birmingham. — July 7th. Electric Supply Department. 500-kVA three-phase transformers. (See this issue.)

Single-phase and three-phase house service type meters. (See this issue.)

Cheadle and Gatley.—June 29th. Electricity Department. 6.6-kV switchgear for Clays Works sub-station. (June 16th.)

Consett.—July 15th. U.D.C. Installation of electric lighting in 246 houses on various estates. Plans by T. Hutton, surveyor.

Coventry.—July 8th. Electricity Department. One ferro-concrete cooling tower and pond and one brick-built chimney. (See this issue.)

Derby.—July 8th. Electricity Department. Electrical control equipment for domestic apparatus. (See this issue.)

Dumfries.—June 30th. Electricity Department. One four-panel, 3,300-V switchboard. (June 16th.)

Dunfermline.—July 3rd. Town Council. Electric lighting in 204 houses at Brucefield. Town Clerk (deposit £1 1s.).

Eccles.—June 26th. Electricity Department. Renewal of the existing lighting installation and modification and extension of the power installation in the Town Hall. Borough electrical engineer, Electricity Offices, 1, King Street (deposit £1 1s.).

Exeter.—July 5th. Electricity Department. One battery-driven tower wagon. (See this issue.)

Falkirk.—June 24th. Electricity Department. One cooling tower and one steam generating unit. (June 9th.)

Fife.—July 7th. County Council. Heating and electrical installation at new police station, North Street, St. Andrews. County Clerk, Cupar (deposit £1 1s.).

Gateshead.—Town Council. Electrical installation at a new nurses' home at High Teams Institution and alterations to the maternity block, &c. Plans by F. H. Patterson, borough engineer, Municipal Buildings.

Halifax.—July 5th. Electricity Department. One station auxiliary switchboard. (June 16th.)

Huddersfield. — July 7th. Estate Department. Reconstruction of the lift at the George Hotel, necessitated by the change-over from DC to AC. (See this issue.)

India.—SIMLA. — July 18th. Indian Stores Department. Insulating materials, including tapes, micanite sheets, compounds, &c., for twelve months. (T. 23575/39.)*

August 3rd. Electric lamps for twelve months. (T. 23576/39.)*

Kent.—June 27th. County Council. Electrical installation in new nurses' home and adaptations at West View Institution, Tenterden. W. H. Robinson, county architect, Springfield, Maidstone (deposit £2 2s.).

London. — METROPOLITAN WATER BOARD.—June 26th. Stores, including electric lamps, for twelve months. 173, Rosebery Avenue, E.C.1.

June 30th. Two electrically operated goods lifts. (See this issue.)

H.M. OFFICE OF WORKS.—June 29th. Electric lighting and power installation at Loman Street premises. (July 16th.)

BETHNAL GREEN.—July 7th. Electricity Department. One 500-kVA transformer. (See this issue.)

ST. PANCRAS.—July 11th. Electricity Department. Cables, meter boards, stoves, fires, washboilers and water heaters for twelve months. (See this issue.)

Manchester.—July 3rd. Electricity Committee. 33-kV switchgear, 750-MVA rupturing capacity. (June 16th.)

Mansfield.—July 3rd. Electricity Department. Three voltage regulating transformers and one seven-panel remote controlled switchboard. (June 9th.)

Milford Haven.—June 26th. Electricity Department. Laying and jointing of low-voltage mains. (June 16th.)

New Zealand. — WELLINGTON. — July 7th. Post and Telegraph Department. Battery plates. (T. 23024/1939.)*

July 20th. Two single-channel carrier telephone systems. (T. 23029/1939.)*

August 15th. Public Works Department. Two outdoor lightning arrestors and two surge counters. (T. 23311/39.)*

Rhyl.—July 17th. Electricity Department. Extra-high-voltage cable and switchgear and transformers. (See this issue.)

Salford.—July 11th. Electricity Department. P.i. lead-covered cables for three years. (See this issue.)

Saltcoats (AYRSHIRE). — June 30th. Town Council. Electrical work at block of seven shops at New England housing estate. Joint Town Clerks (deposit £1 1s.).

South Africa.—CAPE TOWN.—June 28th. Electricity Department. Hard-drawn copper-wire. (T. 23175/39.)*

June 29th. House service cut-outs. (T. 23176/39.)*

June 29th. 20,000 pole fuses, complete with bolts, nuts and washers. (T. 23177/39.)*

June 30th. Overhead line material, including spindles, clamps, stay rods, line tap connectors and insulators. (T. 23179/39.)*

JOHANNESBURG.—June 26th. Railways and Harbours Administration. Telegraph material, including poles, bases, plates, stay wire, &c. (T. 23149/1939.)*

July 31st. Superheater elements. (T. 23147/1939.)*

PRETORIA.—July 6th. Union Tender and Supplies Board. One 3-kW, 110-V Diesel engine-driven electric lighting plant complete with generator, switchboard, &c. (T. 23511/39.)*

July 20th. Thirty magneto telephone switchboards. (T. 23513/39.)*

July 20th. Two 100-kVA transformers. (T. 23675/39.)*

August 3rd. Floor pattern magneto switchboards. (T. 23676/39.)*

Southern Rhodesia.—GWELO. — June 29th. Municipality. Distribution line material, switchgear, &c., for extensions to the electricity undertaking. (T. 23397/1939.)*

Stone.—June 28th. Electricity Department. Extra-high-voltage overhead line and underground cable. (June 9th.)

Uruguay.—MONTEVIDEO. — August 4th. State Electricity Supply and Telephones Administration. Iron insulator bolts or pins. (T.Y. 23467/1939.)*

Wolverhampton.—July 7th. West Midlands J.E.A. 33,000-V cable at Willenhall sub-station. (See this issue.)

Orders Placed

Aberdeen.—County Council. Accepted. Electrical work for police buildings and P.A. Offices at Huntly (£151).—A. H. Shaw.

Bedford.—Education Committee. Recommended. Electrical installation at Clapham Road school (£245).—B. Swaffield.

Blackpool.—Highways Committee. Accepted. Installation of electric lighting, heating and power at Lennox Gate pumping station.—G. D. Lax.

Brighton.—Electricity Committee. Accepted. Fan motor contactor gear for the new Babcock and Wilcox boilers at Southwick (£988).—Allen West & Co.

Burnley.—Electricity Committee. Accepted. 3,736 yd. four-core cable (£2,080) and 4,113 yd. four-core cable (£1,349).—Henley's.

Burton-on-Trent.—Electricity Committee. Accepted. Laying electricity mains to Tutbury (£2,976).—Crompton Parkinson.

Cheshire.—County Council. Accepted. Electrical work for extensions to the Parkside Mental Hospital, Macclesfield (£8,550).—S. Dickenson.

Derby. — Town Council. Accepted. Electric wiring at Municipal Buildings (£5,141).—Meta, Ltd.

Gateshead.—Town Council. Accepted. Electrical installation at extensions to the Sheriff Hill Hospital (£3,725).—Devereux Moodie & Co.

Ipswich.—Electricity Committee. Accepted. Extra-high-voltage switchgear for twelve months.—Ferguson, Pailin.

Leeds.—Health Committee. Accepted. Cable and switchgear for Gateforth Sanatorium (£377).—Electricity House, Ltd.

London.—L.C.C. — Accepted. Wiring and fittings for electric lighting, &c.: Two blocks of dwellings at Strood House, Tabard Garden estate, Bermondsey (£461).—Holliday & Son (Electrical), Ltd. One block of dwellings at Battersea Bridge Buildings, Battersea (£757).—Newman & Watson.

Education Committee. Accepted. Electricity installations: Westminster Institute (£3,008).—Electrical Installations, Ltd. Ashford Residential School (£1,119).—City Electrical Co. Norwood Children's Homes (£2,154).—A. Meckhonik. Beaufort House, Fulham (£966).—Jacob, White & Co. Oldhill Street school, Hackney (£1,151).—Colston Electrical Co. Whitefoot Lane school, Lewisham (£784).—Newman & Watson.

BATTERSEA. — Electricity Committee. Accepted. Four transformers (£1,120) and two transformers (£560).—British Electric Transformer Co.

FULHAM.—Electricity Committee. Accepted. Main extra-high-voltage switchgear for power station extension (£118,342).—Met.-Vick. Electrical Co. High-pressure steam pipework (£47,810).—Aiton & Co.

Margate.—Town Council. Accepted. Lighting of Minnis Bay Parade, Birchington (£50 per annum).—Isle of Thanet Electric Supply Co.

Middlesbrough.—Education Committee. Accepted. Installation of electric lighting and power at the Hugh Bell school (£1,421).—Law & Burns.

Plymouth.—Electricity Committee. Accepted. Switchgear (£1,987).—Met.-Vick. Electrical Co.

Gas Committee. Accepted. Electric generator (£610).—Humphreys & Glasgow.

Portsmouth.—Contracts Committee. Accepted. Cooker control units.—J. H. Tucker & Co. Switch-fuses.—G. P. Dennis & Co.

Stockton-on-Tees.—Town Council. Accepted. Electric lighting of the new Newham Grange Maternity Home (£1,033).—R. Pickersgill & Son.

Swansea.—Electricity Committee. Accepted. Mercury arc rectifier equipment (£464).—Hewittic Electric Co.

Warrington. — Electricity Committee. Accepted. Transformers.—Electric Construction Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Avonmouth.—Additions to the Royal Edward Dock, including new grain store building (£643,000); W. P. Wordsworth, engineer.

Abercarn.—Houses (26), Pentwynmawr, for U.D.C.; Malcolm T. Benjamin, surveyor, Council Offices, Abercarn.

Abingdon.—Houses (50), Oxford southern by-pass, for R.D.C.; surveyor.

Bacup.—Bungalows (54), Gordon Street and Hamerton Street; H. Guffogg, borough surveyor, Town Hall.

Banbury.—Buildings (£60,000), for Horton General Hospital; C. Burns, architect, Stone Lodge, Vale Avenue, Tunbridge Wells.

Barnet.—New Council offices, for R.D.C.; Burgess, Holden & Watson, architects, Station Approach, Beaconsfield.

Barnsley. — Houses (75), clearance areas; borough engineer. Houses (54), Coronation Street; C. D. Potter & Sons.

Baschurch (SHROPSHIRE). — Senior school (£17,000); Wood & Goldstraw, architects, Station Road, Tunstall, Staffordshire.

Bebington.—Three auxiliary fire stations, for T.C.; borough surveyor.

Bedlington.—Houses (80), Red House estate, for the U.D.C.; W. Hall, surveyor.

Bedworth.—Houses (100), Poplar Farm estate (£40,238); U.D.C. surveyor.

Birmingham. — Dental hospital (£40,000), Hospitals Centre; Lanchester, Lodge & Davies, architects, 19, Bedford Square, W.C.1. Factory and offices in Summer Lane; Wm. Wilkinson & Son, builders, Handsworth. Factory and offices in Cheston Road, Aston; Maddocks & Walford, builders, Tyburn Road.

Blackburn. — Crematorium; borough engineer.

Blackpool.—Houses (100), Burnside Avenue, &c.; R. Fielding & Son. Junior school, Bispham, and school, Little Marton; Education Committee. Council school at Cherry Tree Road; J. C. Robinson, borough architect, Municipal Buildings.

Bolton.—Senior school at Lever Edge Lane; W. G. Codling, borough engineer, Town Hall.

Brighouse.—Houses (127), Slade Lane; G. & G. H. Crowther, 1, Princess Street, Huddersfield.

Brighton.—Crematorium, Bear Road; Brighton Cemetery Co., Ltd.

Bristol.—Houses (106), Filwood estate; J. Nelson Meredith, city architect.

Bromsgrove. — Fire station buildings (£7,390); surveyor, Town Hall.

Buckingham. — New police station; Slough, for Standing Joint Committee; James & Bywaters and Rowland Pierce, architects, 5, Bloomsbury Street, London, W.C.1.

Burton-on-Trent. — Enlargement of fire station (£19,750); borough engineer.

Canterbury. — New Simon Langton girls' school (£67,038); city architect.

Cardiff.—Schools (£391,000); Education Committee.

Castle Bromwich.—Houses (66), Selworthy Road, Windleaves Road, and Wickham Road; Castle Bromwich Estates, Ltd.

Chester-le-Street.—Houses (60), Whitehall estate (£20,922); U.D.C. surveyor. Houses (600) at Kibblesworth; R.D.C. architect.

Coventry.—Houses (330), Scott Lane, Bradford Aerodrome Estates; borough surveyor.

Croydon.—Houses (66), and shops, Leighton Street area (£30,860); borough engineer.

Devon.—Grammar school, Barnstaple, for C.C.; J. Dennis & Son, contractors, Braunton, North Devon.

Doncaster.—Offices at gas works, for the T.C. (£8,856); John Holmes (Builders), Ltd., 54, Queens Road. Public library, for the West Riding C.C. (£7,000); T. Jenkinson & Sons (Doncaster), Ltd., contractors, Bentley Road.

Dukinfield.—Junior and infants' school, Globe Lane, for E.C.; P. Howard, architect, 88, Mosley Street, Manchester.

Durham.—Extensions to science library at Durham University (£35,000); G. W. Lazenby and Co., builders, Ferryhill.

Eire.—DUBLIN.—Houses (497), Crumlin North housing area, Section 3, for T.C.; H. G. Simms, housing architect, 5, Wellington Quay.

Flintshire.—Central school at Saltney (£50,000); R. G. Whitley, county architect, County Offices, Mold.

Gateshead.—Flats (22), Saltwell Road; H. Durham, builder, Durham Road. Houses (36) on the Harlow Green estate; E. P. Calderwood, builder, Chow Dene estate. Factory, Team Valley estate, for Young & Co.; Stephen Easten, Ltd., builders, Milburn House, Newcastle-on-Tyne.

Glasgow.—Baths and washhouses at Stoneyhurst Street, Possilpark (£65,000). Houses (140) and hostel; housing director.

Halesowen.—New hospital buildings (£25,000); A. T. Butler, architect, Priory Street, Dudley.

Hampton.—Flats (36) and garages, Hampton Road; G. P. Townsend, architect, 14, Trafalgar Road, Twickenham.

Hanworth.—Flats (234), Little Park estate; Bunting Construction Co., 49, Baker Street, W.1.

Harrogate.—Junior technical school; education architect, County Hall, Wakefield.

Hastings.—Senior school, Tower Road; Education Committee.

Hemsworth.—Houses (26), for R.D.C.; W. T. Lynam, surveyor, Market Chambers.

Ilkley.—New hospital buildings; W. Harold Watson, architect, Barstow Square, Wakefield.

Inverness-shire. — Houses (188), for County Council; architect, County Council, Inverness.

Kilmarnock.—Houses (750), Shortlees Farm, Riccarton; Scottish Special Housing Association.

Leamington (WARWICKS). — Theatre, assembly hall, and shops at The Den, Warwick Street (£60,000).

Leicester.—Houses (204), New Parks Estate, for Housing Committee; Housing architect, Municipal Offices, Charles Street, Leicester.

Liverpool.—Flats (192), Byles Street site, for T.C.; director of housing, Blackburn Chambers, Dale Street, Kingsway.

London.—(FINCHLEY). — Houses (25), Rocklands, Gordon Road; Batty & Stevens, 320, Regents Park Road, N.3. (N.W.).—Factory and offices in Stanhope Street, for Solus Electrical Co.; F. Durrant, architect, 114, Cheapside, E.C.2. (SHOREDITCH).—Factory and stores, East Road, for Dottridge Bros.; A. & V. Burr, architects, 85, Gower Street, W.C.1. (TOTTENHAM).—Flats (216), Allington estate (£123,000); borough engineer.

Luton.—Extensions (£28,000), Spittlesea Isolation Hospital; borough surveyor.

Manchester.—Police and fire station, Altrincham Road, opposite Greenwood Road, Northenden, for Watch Committee; G. N. Hill, city architect. Senior school, Ryder Brow Road and Old Hall Drive, Gorton, for Education Committee, Deansgate.

Mansfield.—Extensions to Forest Hospital (£13,484), for T.C.; borough surveyor.

Market Drayton.—Houses (100), Dale Lands; M.W.M. Maisonettes, 40, Pall Mall, London, S.W.1.

Matlock. — Houses (32), Northwood Lane, Darley Dale; Toft Bros., architects, Darley Dale.

Merton.—Works, for R. Corfield, Ltd., Lombard Road, London, S.W.19.

Middlesbrough.—Out-patients' block at Holgate Hospital, for the T.C.; S. Coates, Ltd., builders, Langbaurgh Place.

Middleton.—Houses (48), Grimshaw Lane and Sandy Lane; Stonier & North.

Morecambe and Heysham.—Junior and infants' school at Torrisholme; R. B. Savage, borough surveyor, Town Hall.

Newcastle (STAFFS).—Maternity home, London Road (£11,450); A. Cotton, borough surveyor, Town Hall.

Newcastle-on-Tyne. — Flats (36), St. James Road, for the Blackett-Ord estate; F. M. Dryden, architect, 6, Market Street, Newcastle. Houses (22), Copperas Lane; G. Bainbridge, builder, High Wood Road, Lemington. Houses (30), Broadwood Road; Hetherington & Wilson, architects, County Chambers, Newcastle.

Newport (MON.). — Houses (100), Maindy, for A. F. Moss; H. Burgess, architect, Pontypridd.

North Riding.—Police station at Robin Hood's Bay, for the C.C.; county architect, County Hall, Northallerton.

Ormskirk.—Houses (300) and shopping centre at Melling, near Ormskirk; E. R. Jones, builder, 99, Great George Street, Liverpool.

Plymouth. — Fire station, Wolseley Road; borough engineer.

Pudsey.—Fire station, Chapeltown, for T.C.; borough surveyor.

Rawtenstall.—Houses (40), Hall Carr estate; borough engineer.

Romsey.—Houses (30), Maybush; W. J. Quick, builder, 222, Hill Lane, Southampton.

Rowley Regis.—Town hall, for T.C.; borough surveyor.

Rugeley (STAFFS).—Houses (250) on the High Oak Housing Estate, Middle Road, Penkridge Bank, Cannock Chase, for High Oak Estate (Rugeley), Ltd. (£73,000); G. G. Kidwell, contractor, High Oak, Penkridge Bank.

Selby.—Houses (32) at Cawood and Camblesforth; R. F. Braithwaite, architect, 22, Park Street.

Sheffield.—Central bus station, Pond Street (£172,500). Baths and pavilion, Parson Cross estate (£14,100); city engineer. School, Parson Cross, Education Committee. Houses (38), Lyminster Road and Fox Hill Road, for D. Hurrell, builder, 1, Holyoake Avenue. Houses (57), Skye Edge Road, for M. Bonner, builder, 100, Psalter Lane.

Shrewsbury. — Freemasons' Hall at Brookleigh, Abbey Foregate, Shrewsbury (£10,000); F. H. Shayler, architect, The Red House, The Mount.

Slough.—Factory (£250,000), Bath Road, for Aspro, Ltd.; R. MacGrath, architect, 38, Conduit Street, London, W.1. Houses, (268), east side of Stoke Poges Lane, for T.C.; F. R. Duxbury, town clerk, Town Hall.

Smallburgh.—Houses (44), for R.D.C.; A. Peploe, clerk, Council Chambers, Stalham, Norwich.

South Kesteven.—Houses (61), for R.D.C.; C. East, surveyor, Council Offices, 41, North Street, Bourne, Lincolnshire.

South Shields.—R.C. School (£10,000): J. Cummings, contractor, Matamba Terrace, Sunderland.

Stoke-on-Trent.—Houses (68), Birches Head Road, Hanley; J. Jackson, Sneyd Green. Houses (24), Power Street, Hanley; Lees & Son, Newcastle Street, Burslem.

Sunderland.—96-bed ward at the Municipal Hospital (£30,235); G. Henderson, contractor, Boldon Lane, East Boldon, Co. Durham.

Swadlincote.—Houses (120), Meadow Lane estate (£37,877); U.D.C. surveyor.

Thedwastre.—Houses (54); R.D.C. surveyor.

Thingoe.—Houses (60), for R.D.C.; Hunt & Coates, architects, 51a, Abbeygate Street, Bury St. Edmunds.

Urmston. — Houses (105), Southgate estate, Flixton; J. Barker.

Walsall.—Factory, Wednesbury Road, for Walsall Lithographic Co., Midland Road.

Warrington. — Extensions, confectionery works, Delamere Street; Bennetts.

Watford. — Police station (£55,400); Herts C.C.

Wellingborough.—Extensions to factory, Stanley Road, for Midland Boot Co.

West Dean.—Houses (50); R.D.C. surveyor.

West Lancashire.—Houses (68), for R.D.C.; R. Rosebotham, surveyor, 52, Derby Street, Ormskirk.

Whiston.—Houses (44), for R.D.C.; surveyor.

Worksop.—Premises in Bridge Street, for Worksop Co-operative Society, Ltd.

Worthing. — Hospital extensions (£80,000).

York. — Omnibus station, Rougier Street, for T.C.; city surveyor.